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TROPICAL DISEASES BULLETIN

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BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

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SUMMARY OF RECENT ABSTRACTS*

IX. LEPROSY†

General

Two scholarly papers have appeared in which the name "leprosy" is discussed. MacArthur (p. 518) claims that the word was used in mediaeval Britain so loosely that it cannot be regarded as referring necessarily to Hansen's disease; the incidence of true leprosy was probably quite low. Lendrum (p. 313) shows that the name largely disappeared from Europe in the 15th Century, when there was a great extension of syphilis and when "syphilis" therefore afforded a convenient way of explaining any skin eruption without making the patient an outcast.

Classification

The classification of leprosy is discussed by Sen (p. 314) in general terms, and by Mukherjee (p. 314) who proposes 4 primary classes:—leproma, lepride, indeterminate and anaesthetic. Gatti and Cardama (p. 423) hold to the triple primary classification of lepromatous, undifferentiated and tuberculoid; reactional states are divided according to the type of disease.

Wade (p. 945) proposes a scheme based upon the South American system but including some features of the Cairo system, which represents a synthesis of the answers given by a number of leprologists whose comments were sought. It contains 4 first-order classes—lepromatous, tuberculoid, indeterminate and borderline—and 2 subordinate classes—maculo-anaesthetic and polyneuritic. Subdivisions of these classes are included. Chaussinand (pp. 818, 1143) classifies leprosy as benign or malign, and secondarily into tuberculoid and indeterminate in the benign form, and lepromatous in the malign form. Tuberculoid leprosy is again subdivided into minor, major and borderline forms. Indications of state and activity are also provided for, and of bacteriological findings.

Rotberg (p. 1052) suggests modifications of the Havana classification, to use the word "bipolar" in place of "borderline", and "infrapolar" in

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1953, v. 50. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on leprosy in this series see the November issues of the *Tropical Diseases Bulletin* each year since 1939.

place of "indeterminate". In cases with only nerve lesions and no skin lesions the classification would be tuberculoid if the lepromin test was definitely positive, and infrapolar if it was negative or weak.

Epidemiology

Rogers and Adamson (p. 1050) and Doyle (p. 1050) report cases of leprosy diagnosed in Britain, though acquired abroad, which emphasize the importance of closer acquaintance with tropical diseases. Three new indigenous cases are reported from Norway by Melsom (p. 519); they were in children of a leprous mother. Schneider (p. 519) describes the form which has existed in Memel since the last quarter of the 19th century.

Brown (p. 418) has made a number of surveys in Uganda, where incidence was found to range from 4·5 to 22·2 per 1,000, with very high rates in the west (116 per 1,000) and east. A trough of low incidence runs from south-west to north-east.

Leprosy exists in the Canary Islands, where Carlos Gyorko (p. 520) estimates that the incidence rate is 1·86 per 1,000.

Cochrane (p. 520) describes the leprosy situation in Nigeria, stressing the cooperation which exists between Government, Missions and BELRA, and the success of the segregation centres.

Davison (p. 1141) gives an account of the advance made in the control of leprosy in South Africa since 1915. The computed incidence is 0·77 per 1,000 against 5·5 in Southern Rhodesia, and 11·5 in Swaziland. There are 5 institutions for segregation.

Austin (p. 419) made a survey of the British Solomon Islands, where leprosy is prevalent in the central hilly parts. There is a Government leprosy hospital in Guadalcanal, and there are small settlements on other islands. Any attempt to control leprosy by force would probably be useless, but knowledge of the benefit of modern treatment will gradually spread. Gray (p. 629) gives an account of leprosy in American Samoa, where 41 of the 45 recorded cases can be traced to 3 infected family groups.

González Prendes and Ybarra Pérez (p. 1050) consider that leprosy was not present in the Americas until introduced via the Antilles from Europe, Africa and India. They (p. 1051) give an account of the incidence in Cuba.

Doull *et al.* (p. 946) comment on the recorded deaths from leprosy in the United States; an improvement in the figures for recent years is attributed to the new forms of treatment. In Mexico Nuñez Andrade (p. 521) estimates the number of persons with leprosy at more than 50,000.

Gomes (p. 1051) calculates that in the countries of South America the incidence varies from 25 to 0·35 per 1,000, presenting an international problem which should be dealt with by international organizations. Convit *et al.* (p. 121) report on a highly inbred community of German extraction living in Venezuela, in which the incidence of leprosy was about 10 per cent. The lepromin test was positive in 55·3 per cent. of persons negative to tuberculin and in 92·5 per cent. of those positive to tuberculin. The implications of this, in possible cross-sensitization, are discussed.

Aetiology

Cochrane (p. 121) describes a method of assessment by taking 16 skin smears for examination, and grading each smear by a numerical method, to determine a bacteriological index. A simple method for concentrating leprosy bacilli from skin in closed cases of leprosy is described by Dharmendra and Mukherjee (p. 314).

The leprosy bacillus will not stain with Sudan Black B.N. under conditions in which the tubercle and rat-leprosy bacilli take the stain; BERMANN (p. 946) regards this as evidence of the affinity between the two last organisms. Fluorescence microscopy is recommended for the examination of material from tuberculoid leprosy by CURBELO HERNÁNDEZ *et al.* (p. 1052), and GONZALES PRENDES *et al.* (p. 1142) much prefer this to the Ziehl-Neelsen method.

MARIE-SUZANNE *et al.* (p. 1150) report a comparative histological study of lesions provoked in white mice by *Myco. leprae* and cultures of acid-fast organisms isolated from cases of leprosy. Details should be sought in the original.

An acid-fast organism, not *Myco. tuberculosis*, has been isolated from the nasal mucus of a leprosy patient by DE SOUZA-ARAUJO (p. 419); it is pathogenic for guineapigs and cebus monkeys.

Pathology

An Atlas of Leprosy has been prepared by MITSUDA (p. 1180), in which there are 109 plates, of microscopic sections, clinical appearances and pathological specimens.

In a criticism of the views expressed by KHANOLKAR on the spread of leprosy bacilli along nerves, LOWE (p. 720) makes the point that this is accepted by most leprologists, but that it is only one of the routes by which bacilli reach the skin; bacilli spread also by the blood and lymph vessels. MONTEL (p. 423) contends that pure nerve leprosy sometimes precedes leprosy of the skin; when the skin is at last affected the form of leprosy is usually found to be tuberculoid, amenable to sulphone treatment.

CLEVE and PRUITT (p. 947), in discussing the relatively high incidence of alopecia leprotica in Japan, attribute it to the common practice of repeatedly shaving the scalps of newly-born children and the consequent increase in the possibility of infection through the numerous small injuries sustained by the scalp. They do not think that scalp infection is vascular in origin, a conclusion challenged, in comment, by Muir, who also disagrees with the statement that contraction of leprosy by healthy adults is rare, and usually open to question.

DHARMENDRA *et al.* (p. 721) discuss the hypopigmented flat patches in leprosy and their classification. If they are bacteriologically negative and the lepromin test is positive, they take a relatively benign course and may be regarded as non-lepromatous (macular variety). If they are bacteriologically positive and the lepromin test is negative they tend to take a malignant course and may be regarded as lepromatous (macular variety). Only those with bacteriological and lepromin tests both negative or both positive should be regarded as indeterminate.

Extensive experience of the staining of skin with Sudan III or Scharlach R for lipoids has led AZULAY and CEZAR DE ANDRADE (p. 948) to state that lipoids are present only in lepromatous cases (though absent in 5 per cent. of non-regressive cases). Lipoids were absent in all simple inflammatory and tuberculoid cases, and their presence, therefore, is a useful indication of a lepromatous tendency.

Autopsy studies in leprosy indicated that there was marked diminution of the substance which gives a positive reaction in the ketosteroid test, especially in lepromatous leprosy (SUZUE *et al.*, p. 33).

MAUZÉ and ARNAUD (p. 1143) have studied the polymorphonuclear leucocytes and the sedimentation rate in leprosy; there was abnormality in a

high proportion of cases. In comment, Muir remarks that the sedimentation rate is not affected by leprosy alone to any great extent.

Lepromin test

De Faria (p. 1053) has made a study of the Mitsuda reaction, which indicates that the lipoids rather than the protein and polysaccharide fractions of *Myco. leprae* are responsible for the late reaction. He thinks that only the early reaction is allergic in nature and that the late reaction is independent of antigen-antibody mechanism, and is due mainly to natural resistance, which is responsible for destruction of the bacilli and liberation of lipoids, which stimulate the granulomatous reaction. When resistance is absent, the reaction fails. Preparations of the skin of normal persons, injected intradermally, give a reaction similar to, but weaker than, the late Mitsuda reaction. Other elements than the leprosy bacilli, therefore, have some effect in producing the late reaction.

Lowe and McNulty (p. 948) studied the relationship between tuberculosis and leprosy, by using the lepromin and the tuberculin tests, and BCG. Studies by various people indicate that the two tests are not independent, but that there is a common factor, probably exposure to tuberculosis, which tends to make the tests agree. BCG given orally seems to convert lepromin-negative tests to positive more frequently than tuberculin-negative to positive; with injected BCG, however, the authors found more tuberculin conversions than lepromin conversions, though the lepromin conversions were more permanent. Direct evidence that BCG confers resistance to leprosy is as yet scanty, though two suggestive reports are quoted. It seems necessary that BCG schemes should be so organized that a clear indication of their value in leprosy may be expected. In leprosy patients the injection of BCG had some effect in producing a positive lepromin reaction or increasing its intensity.

Zubiri and Mar Moñux (p. 950) found the Mitsuda and Fernandez tests positive in 42·64 and 57·35 per cent. of persons living in an area where leprosy is not endemic. There was a strong relationship between the Fernandez and the tuberculin reactions, which may indicate allergy to the genus *Mycobacterium*.

Bechelli and Quagliato (p. 1055) used the Mitsuda test in patients with tuberculoid leprosy in the stage of reaction, finding most of them positive; this shows that a positive test can co-exist with the presence of bacilli.

Diagnosis: Clinical findings

Lima (p. 123), in a paper of historical interest, discusses the diagnosis of leprosy.

A new technique for the histamine test is described by Argüelles Casals (p. 1052) who induces the formation of histamine by the tissues by pinching the skin with the finger nail. Where the cutaneous nerves are affected by leprosy the erythematous reaction does not appear, and early leprous lesions show up as white patches in the erythematous healthy skin.

The haemagglutination test with tuberculin antigen has been used by several workers. Floch and Sohier (p. 422) found it positive only rarely in tuberculoid and undifferentiated leprosy, but commonly in lepromatous disease. Marco Ahuir *et al.* (p. 422) show that it is positive at high titre in untreated leprosy and during the lepra reaction, and at low titre in patients recovering under treatment. It is negative in patients whose condition is good, and in tuberculoid leprosy. Levine *et al.* (p. 123) think that *Myco. tuberculosis* and *Myco. leprae* stimulate the production of

common agglutinins in human sera and therefore presumably possess common antigens; immunization with BCG may therefore be valuable. The haemagglutination and the conditioned haemolysis test were found by Gernez-Rieux *et al.* (pp. 33, 315) to be positive in 92–97 per cent. of lepromatous patients and in 42–61 per cent. of tuberculoid and indeterminate patients. The difference was enough to suggest that the tests would be useful in classification and prognosis.

Ross and Gemar (p. 1143) have used the Kahn universal serological reaction in leprosy, and conclude that although there is no distinctive serological pattern in lepromatous leprosy, the existing type of pattern may be altered by sulphone treatment, and the test may therefore have a value in prognosis. Various serological tests for syphilis gave up to 58 per cent. of false positive results in leprosy patients (Portnoy *et al.*, p. 315; Gupta *et al.*, p. 629); the latter authors show that if the sera are first heated to 65°C. for 4 minutes the number of false positive results is greatly decreased.

Schmid and Thillainathan (p. 818) found the skin reaction with luotest (a preparation of syphilitic rabbit testis) positive in 13 of 69 neural and 5 of 69 lepromatous cases. Serological tests for syphilis tend to be positive in lepromatous rather than neural leprosy.

Gómez Orbaneja and García Sanz (p. 124) discuss the diagnostic value of reticulin in the different forms of tuberculoid leprosy.

Hamazaki (p. 422) has investigated the specific leprosy pigment which may be found, by appropriate staining, in lymphatic glands.

Hsiao (p. 629) analyses the ear, nose and throat lesions in 73 cases of leprosy.

Lima (p. 124) discusses the association of tuberculosis with leprosy. From the records at Carville in the United States Gray and Bancroft (p. 946) conclude that although tuberculosis still remains a common cause of death in leprosy, the proportion of deaths due to tuberculosis has decreased since the introduction of sulphones in treatment.

Treatment

Cochrane (p. 220) discusses the treatment of leprosy, particularly the question of the activity of monosubstituted and disubstituted sulphones. He thinks that, because the development of a leproma may take up to 10 years, we may have to wait 10–15 years before we can come to any conclusion on the permanency of sulphone "cures". Having analysed results obtained with sulphones in Chingleput, South India, Paul (p. 126) concludes that massive dosage serves no useful purpose; it is not the quantity of drug but the duration of regular treatment which matters—not less than $2\frac{1}{2}$ to 4 years for moderate lepromatous cases. He prefers injection of oil suspensions of sulphone to oral administration of soluble products.

Azulay (p. 951) examined biopsy specimens from lepromatous patients who had received sulphone therapy for several years; half still showed the lepromatous picture, a quarter showed regressive lepromatous infiltration and a quarter showed simple inflammation.

Dreisbach (p. 126) has studied the sulphone content of milk of mothers on sulphone treatment, in relation to the safety of the child from infection from the mother; Touzin and Merland (p. 316) think that it would probably not be enough to protect the infant.

Francis (p. 425) discusses the low toxicity shown by DDS in bovines, in which the concentration in the brain is low. Experimental work in guinea-pigs indicates that DDS accumulates in various organs, and Floch and Lecuiller (p. 221) therefore advocate, in treatment of patients, a rest of

one day each week and one week every 2 months. Their dosage (200 mgm. each day) is considerably higher than that now recommended by many workers.

As a result of a controlled experiment Roy (p. 34) considers that there is an advantage in injecting subcutaneously a suspension of DDS rather than in giving it by mouth; the amount of drug and the period of treatment are lessened, but there is a disadvantage in the trouble of injection. Gilbert (p. 723) treats out-patients by weekly injections of DDS suspended in coconut oil, the dose being raised gradually from 100 to 800 mgm. Patients who cannot attend each week are given tablets of DDS to be taken by mouth each day.

In a report on the treatment of 10,000 leprosy patients with dapsone (DDS) in Nigeria Garrett and Corcos (p. 125) state that the dose finally fixed for out-patient use was a maximum of 0·4 gm. twice a week. The results in tuberculoid leprosy were satisfactory, and in lepromatous leprosy the great majority of patients improved, but lepra reactions of consequence occurred in 10 per cent. and repeated nerve reactions in 10 per cent. In almost all, the bacteriological progress was steady, and the general health of the patients usually improved greatly; dermatitis occurred in 2–3 per cent. Good results with DDS, especially in lepromatous leprosy and in patients with ulcers and with reactions, are reported by Bessuges (p. 819). Supplements such as iron, folic acid and vitamin B12 had sometimes to be given.

In non-lepromatous leprosy the daily administration of 100 mgm. DDS by mouth does not produce any marked haematological changes, even if continued for a long time (Dharmendra and Chatterji, p. 1145). Montoya and Pesce (p. 723) report mental symptoms in patients treated with DDS in doses of 300 mgm. daily by mouth [usually considered excessive]. Montel (p. 34) describes furunculoid eruptions, resembling acne, which may occur during the course of treatment with DDS; the pus from them is rich in bacilli.

In a comparison of DDS, Sulphetrone, Diasone and Promin, Pennek (p. 722) found DDS the most valuable. Its action was most favourable in lepromatous cases.

Floch and Sureau (p. 424) inject succinyl DDS (2 to 3 cc. of a 25 per cent. solution) round thickened and tender nerves, once or twice a week. Ramanujam (p. 1145) has used a preparation of DDS with an added sodium acetate group (Sulfon-Cilag) by intravenous or subcutaneous injection. Good results in a few patients with lepromatous leprosy treated with a derivative of DDS are claimed by Yoshie *et al.* (p. 819).

In his report on the leprosy hospital, Makogai, for 1950, Austin (p. 33) comments on the good results now being achieved with Sulphetrone (by mouth) and dapsone (DDS).

Floch *et al.* (p. 316) show that absorption of Sulphetrone occurs to the extent of 70 per cent. on continued oral administration; daily doses of 3 gm. are the equivalent of 200 mgm. DDS. Floch *et al.* (pp. 221, 424) used Promacetin (a sulphone compound), a preparation of slight toxicity, but found that only one quarter was absorbed into the blood stream; its action was much less effective than that of DDS. Dharmendra *et al.* (p. 34) describe the action of Novotrone, a drug similar to Sulphetrone, which has a similar action.

In a study of 150 lepromatous patients who had been treated with chaulmoogra or sulphones, all were found to have improved, but in half of them the improvement was clinical only. Only 20 became bacteriologically negative (Schujman, p. 521).

In a comparison of the effects of thiacetazone (thiosemicarbazone), Sulphetrone and DDS, on 5 groups of leprosy patients, DAVIDSON (p. 1145) found the best results with thiacetazone at the rate of 200 mgm. daily; DDS and intramuscular Sulphetone gave results slightly less favourable; and oral Sulphetrone gave poor results. For the best results the haemoglobin rate should be above 13 gm. Several groups of workers have used thiosemicarbazone. DHARMENDRA and CHATTERJEE (p. 35) find it useful in patients who cannot tolerate sulphones or who have ceased to progress on sulphones. KNORR (p. 221) reports favourably, as does BUKER (p. 1146) who regards daily doses of 75 mgm. as effective as 150 mgm., the treatment being suspended every fourth week. From Nigeria LOWE (p. 1147) gives a very good account of thiosemicarbazone in oral doses up to 150 or 200 mgm. daily on 6 days each week. It compares favourably with the sulphones, and though toxic effects are more serious (for instance acute agranulocytosis in 4 of 146 cases (LOWE, p. 126)), they are less frequent than with the sulphones. He thinks that it may provide the best treatment yet tried for leprosy. [In a later letter, published in *Leprosy in India*, 1954, v. 26, 150, however, he expresses considerable disappointment with the late results of thiosemicarbazone treatment, and states his definite preference for the sulphones, though thiosemicarbazone may still be useful in some circumstances.] Painful neuritis in a number of cases of leprosy yielded to treatment with thiosemicarbazone (FARIÑAS, p. 1147).

From Australia, however, HUMPHRY (p. 1146) gives an unfavourable account of thiosemicarbazone.

A pyridine aldehyde thiosemicarbazone tried by FLOCH and SUREAU (p. 222) gave promising results in a few patients who had been treated with other drugs.

CHATTERJEE and BOSE (p. 1148) describe a simple method of estimation of thiosemicarbazone in tissue and body fluids.

A favourable effect of isoniazid in one patient with leprosy is reported by TAYLOR (p. 1056). He was given up to 100 mgm. 3 times daily for a long period. LOWE (p. 127), however, writes rather unfavourably of isoniazid.

A few patients with lepromatous leprosy reacted favourably to treatment with a phenazine dye (B.283), and ALLDAY and BARNES (p. 222) think that it deserves further trial.

FLOCH and SUREAU (p. 35) report some success with vitamin C in the treatment of reacting tuberculoid leprosy.

LOWE (p. 36) has used corticotrophin and cortisone in complications of leprosy, namely allergic reactions to chemotherapy, and excessive tissue reactions to the bacilli. Acute manifestations can readily be controlled, but there is serious danger of aggravating the underlying condition, particularly in patients receiving repeated short courses. Hormone treatment was very useful, however, in sulphone sensitivity and in acute and subacute leprous eye inflammation. Hormone treatment of the lepra reaction is reported by several workers. ARGÜELLES CASALS (p. 951), DE SOUZA ARAÚJO (p. 1056), and MELSOM (p. 122) all report favourably on cortisone or corticotrophin, and although relapse occurred in patients with lepra reaction treated with corticotrophin, DORENLOT (p. 722) considers it to be particularly valuable in dangerous reactions in the eye.

GONZÁLEZ OCHOA *et al.* (p. 220) found dihydrostreptomycin useful in severe attacks of lepra reaction. DDS was the most useful drug for general treatment of leprosy; PAS was tried but is not recommended. For the typical lepra reaction CONTRERAS *et al.* (p. 424) have used plasma from calf blood deprived of its anaphylactic properties, and report some improvement. They think that in lepromatous leprosy there is excess of globulin in

the serum and that during severe reaction there is considerable loss of plasma, resulting in hypoproteinaemia; this is compensated by the transfusions. De Souza Lima *et al.* (p. 1053) have used repeated weekly doses of 0·2 gm. BCG by mouth in the treatment of lepra reaction, and report that the results are better than those with any other treatment tried, including antihistamines, cortisone and corticotrophin.

Brand (p. 950) describes the surgical reconstruction of the hand in neural leprosy. The operations for decompression and neurolysis in lepromatous neuritis are described by Guadagnini (p. 1145).

Control

Rogers (p. 819) recapitulates the plan he recommended in 1922 and 1925 for controlling leprosy by isolation of infective patients and examination of contacts at intervals of 6 months for 10 years. It has been used successfully in various parts of Africa and in Nauru. A preliminary campaign of education in the value of the new drugs is a necessity. Bland (p. 127) writes of the importance of segregation in the control of leprosy in Nigeria where local communities are persuaded to provide segregation villages in which the patients can maintain themselves on land provided for them, and where modern treatment is given. Proposals for central leprosaria and networks of rural control services are outlined.

Wheate (p. 127) shows that in Uganda it is not possible to adopt the Nigerian plan of segregation villages. A proposed scheme comprises mass treatment and preventive services, rural preventive units for remote areas, and a satellite settlement 200 miles from the main settlement. Where European control is possible, treatment with a maximum dose of 600 mgm. DDS once a week is given; where European supervision is less close, injections of aqueous Sulphetrone will be given. Discussing the leprosy situation in Uganda, Brown (p. 951) suggests a policy of using the existing settlements as primary residential settlements, and creating more secondary settlements and centres for smaller areas. Treatment facilities may be created at existing dispensaries or at special outposts when organized segregation is not practicable. Williams and Williams (p. 1148) give an account of a joint effort at leprosy control between a medical mission and the local government authorities in Uganda, where two adjacent village settlements have been set up. In one of these DDS is given by mouth (800 mgm. each week) but in the other it is injected every second week (400 mgm.). The injection method is favoured—the patients attend more regularly and it is cheaper. Agricultural work is carried on by the settlement patients.

An account of the Fourth All-India Leprosy Workers' Conference, 1953, is given in the journal *Leprosy in India* (p. 817). Stress was laid on the importance of segregation in village isolation centres where the patients will not feel exiled, and on the importance of avoiding actions which would discriminate against leprosy. Thus, it would be disastrous to allow leprosy to be a cause for divorce. A memorandum on the leprosy work of the Gandhi Memorial Leprosy Foundation (p. 521) in Wardha shows that the scheme for control is practical, suited to a poor village community, and aims at establishing 15 Control Units in the larger Provinces and 17 Control Clinics in the smaller, each Control Unit working on a group of 35–40 villages, and each Control Clinic on 10–15 villages. The chance of success is based on the effective, cheap and easily administered treatment with DDS.

Risi *et al.* (p. 723) discuss the leprosy work done in Brazil, and suggest a new scheme which includes early diagnosis (in contact examination),

treatment, education, and prevention by domiciliary isolation. Bechelli (p. 1051) gives an account of leprosy in São Paulo, Brazil, and the organizations established to deal with it. Incidence appears to be diminishing and the outlook, with the new treatments and BCG prophylaxis, appears to the author to be favourable for eventual eradication.

Fernandez and Carboni (p. 36) discuss modern prophylaxis in leprosy, including isolation, preventive treatment of lepromin-negative contacts, and the use of BCG.

Tisseuil (p. 1055) strongly opposes the view that BCG protects against leprosy, partly because he contends that the delayed Mitsuda reaction is not allergic and therefore is quite different from the tuberculin reaction—if the Mitsuda becomes positive after BCG it indicates that the subject had previous sensitivity to lepromin, or has a tuberculoid lesion. His own experience indicates that BCG does not confer protection.

Rosemberg *et al.* (p. 420) show that in Mitsuda-negative children of leprous parents, isolated from birth, BCG (repeated oral administration) produced positive Mitsuda reactions but not positive Fernandez reactions. In similar children in whom the Mitsuda was faintly positive BCG increased the strength of the reaction, and in these the Fernandez reaction was also positive. BCG can also provoke reactions at the site of previous injections of Mitsuda antigen, and the Mantoux test can also provoke reactions to previous injections of Mitsuda antigen in children who have received BCG. Rosemberg *et al.* (p. 722) gave BCG to a considerable number of children who were negative to both tuberculin and lepromin, either by mouth (1 to 3 doses) or by multiple puncture. Almost all became positive to lepromin, whereas unvaccinated controls remained negative.

Fernandez (p. 1148) has used BCG for prevention of leprosy and comments that he has never seen lepromatous leprosy in a person who has been given it. He suggests lines of investigation to determine the effectiveness of BCG.

Convit *et al.* (p. 421) show that intradermal injection of BCG in Mitsuda-negative patients who had recovered from lepromatous leprosy often reversed the Mitsuda reaction to positive, and more often produced the positive reaction in patients with the indeterminate form who had previously been Mitsuda-negative.

Olmos Castro (p. 122) shows that injection of BCG can produce sensitivity to lepromin in guineapigs. He recognizes a state of hypersensitivity with resistance after BCG injection.

Blanc and Prost (p. 1056) inject a killed culture of an acid-fast bacillus with a view to changing negative to positive Mitsuda tests; they are comparing this with administration of BCG. For the French Cameroons they (p. 1057) advocate a centre for settlement, with dispensary and subcentres for treatment. The killed vaccine is to be tried.

Rat Leprosy

Eisman *et al.* (p. 1149) show that the rat leprosy bacillus can be maintained alive for long periods when stored with dry ice. Millar (p. 1149) was not very successful in attempting to confirm earlier reports that *Myco. leprae murium* could be grown on the chorioallantoic membrane of the chick embryo. Planet *et al.* (p. 724) studied the behaviour of rat leprosy bacilli in relation to reduction of methylene blue and in the tetrazolium test. In this way they found that Promin, Sulphetrone and sulphanilamide did not show any bactericidal action. Gray (p. 37) has studied the respiratory metabolism of rat leprosy bacilli.

The haemagglutination test in which a tuberculin antigen was used was found to be positive in rat leprosy. Viétte (p. 523) remarks that this is in favour of a relationship between the two organisms.

Chang (p. 1150) used mice given rat-leprosy bacilli intraperitoneally in chemotherapeutic tests. He (p. 1151) found drugs effective in the following order:—iproniazid; isoniazid; streptomycin with DDS; DDS; streptomycin; and Diasone. Streptomycin with DDS showed an additive effect. Tanimura *et al.* (p. 820) used various drugs in rat leprosy, noting that those which stimulate the resistance of the animals (chaulmoogra and cepharanthine) act similarly in rat leprosy and human leprosy, whereas those which act on the pathogenic organisms (sulphones and thiosemicarbazone) behave differently in human and rat leprosy.

Several workers have used isoniazid in the treatment of rat leprosy, and the initial effect was good. Barnett and Bushby (p. 522) found that it almost completely inhibited multiplication of the bacilli; Chaussinand *et al.* (p. 523) that none of the treated rats showed clinical lesions and that only slight histological changes could be found; Goulding *et al.* (p. 524) that intracorneal infection responded well, leaving only corneal opacities; and Cruickshank (p. 524) that rats given isoniazid for 20 weeks from the day of infection reacted well, and those given the drug for 4 weeks almost as well. These are preliminary trials and later observations may perhaps show that in the doses used isoniazid was not permanently curative. They do not necessarily indicate that isoniazid is valuable in human leprosy. Gruneberg and Titsworth (p. 724) treated rat leprosy with isoniazid and iproniazid. Results after 29 days of treatment indicated considerable beneficial effect at a daily dosage of 250 mgm. per kgm.; less so at 500 mgm. per kgm. [but the period of treatment and observation is short].

Berti *et al.* (p. 425) have tested analogues of DDS for their action on rats; one was very toxic, and none had a satisfactory effect in rat leprosy (Hadler *et al.*, p. 425). *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

Bhatnagar, V. N. **Altitude and Malaria.** A Review. *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1954, July, v. 2, No. 4, 132–8. [30 refs.]

Jaswant Singh, Krishnaswami, A. K. & Ramakrishnan, S. P. **The Distribution of Human Plasmodia in India.** *Indian J. Malariology.* 1952, Dec., v. 6, No. 4, 415–33, 2 maps. [12 refs.]

Malaria control in India is proceeding so quickly that it is useful to collect figures showing the incidence of the disease today, and the following table gives the percentage prevalence of the different species of plasmodia in the different States in 1950:

State	Parasite Rates	*P. vivax* per cent.	*P. falciparum* per cent.	*P. malariae* per cent.
Andamans	17	81	19	0
Assam	31	32	59	9
Bengal	31	43	54	3
Bihar	31	56	43	1
Bombay	13·5	41	51	8
Coorg		80	20	0
Delhi		60	40	0
Hyderabad	12	55	33	12
Kashmir and Jammu		96	0	4
Junagadh		90	10	0
Kutch		68	31	1
Madhya Bharat ...		35	63	2
Madhya Pradesh ...	21	65	31	4
Madras	10·5	46	43	11
Mysore	5	34	57	9
Nepal		62	38	0
Orissa	18	43	53	4
Punjab	16	61	38	1
Rajasthan	12	65	30	5
Rajkot		8	92	0
Saurashtra		66	34	0
Travancore-Cochin ...		17	26	57
Uttar Pradesh ...	25	39	60	1
Vindhya Pradesh ...		54	38	8
India (General) ...		54·0	40·1	5·9

Plasmodium malariae occurs most in certain parts of Madras—*e.g.*, 75 per cent. in Nilgiris East, and least in the Punjab where it is nearly absent. Details of species prevalence are given by district in an Appendix, and also shown on a spot map. *P. C. C. Garnham*

Soulage, J. & Richet, P. L'incidence paludéenne au cours des opérations militaires dans la région d'Hoa-Binh en 1951. [**Malarial Incidence during Military Operations in the Hoa-Binh Region in 1951**] *Méd. Trop.* Marseilles. 1953, Sept.–Oct., v. 13, No. 5, 617–40, 2 maps & 7 charts.

Hoa-Binh lies in a depression on the left bank of the Black River where it bends north to flow into the Red River a few miles north-west of Hanoi, Indo-China. This depression through which the Black River flows is 7 kilometres long from south to north and 1·5 kilometres wide: it is marshy and entirely surrounded by mountains. A road, the RC6, links Hoa-Binh with Hanoi. Malaria was hyperendemic in this part of Indo-China. In 1930 large-scale antimalaria drainage works were undertaken to combat a severe outbreak of malaria, but these had fallen into complete disrepair. During the Japanese occupation political deportees were concentrated in Hoa-Binh and suffered severe losses from malaria. In May 1947 a strong force of parachutists was dropped in Hoa-Binh without mechanical protection from mosquitoes and with inadequate chemical prophylaxis. Practically all the men engaged went down with malaria. Among 248 of them who were admitted to hospital during May and June 70 exhibited pernicious symptoms; 48 developed coma; and 11 died. When an attack was launched on Hoa-Binh on 14th November 1951 the authorities were fully aware of the malaria hazard and elaborate precautions were taken.

The Vietminh occupation of this area, about a year previously, had caused the exodus of the majority of the indigenous population, which is of the Muong race, either to the mountains or to the Delta which was under French control. Refugees from the mountains began to come back to reconquered Hoa-Binh about the 20th of November and were medically examined soon after arrival. Of 120 children aged between 3 and 13 the spleen rate was 85 per cent., as compared with 33 and 5 per cent. before and after the large-scale antimalaria measures that were undertaken in 1931. The parasite rate was 42 per cent., as compared with 28 and 13. These figures relate to the settlement on the left bank of the river; corresponding rates for a similar settlement on the right bank were slightly higher. The children were very anaemic and in miserable condition. This population returned from the mountains was a dangerous reservoir of malaria infection. The Muongs who had migrated to the Tonkin Delta benefited from their experience: 61 of their children were examined; their spleen rate was 33 and parasite rate 8 per cent. These Muongs needed protection on their return to Hoa-Binh.

The malaria vectors of this region had been *A. minimus* and *A. aconitus*. These were still breeding prolifically. In addition other species had made their appearance, notably *barbirostris*, *jeyporiensis*, *philippinensis* and *maculatus*.

The Franco-Vietnamese forces engaged in operations in Hoa-Binh and along the lower Black River in November 1951 numbered some 14,000. The malaria control measures that were rigorously enforced included the administration of 300 mgm. nivaquine (chloroquine] twice a week to each member of the force; the systematic use of mosquito nets, long trousers, and of insect repellents for men on night duty; the treatment of the infected Muong population with rhodopraequine [pamaquin] and quinacrine [mepacrine]; and the use of residual DDT spraying where practicable. During the ensuing two months of occupation of this highly malarious area not a single case of malaria was reported among the troops.

About a week before the attack on Hoa-Binh similar operations were carried out by a Franco-Vietnamese force numbering 7,000 in the area of Cho-Ben. Cho-Ben lies a few miles to the south-east of Hoa-Binh and the malaria conditions and hazards of the two places are strictly comparable. Too little attention was paid to malaria prevention precautions at Cho-Ben, with the result that two weeks after the commencement of operations an outbreak of 500 cases of malaria occurred: in most the disease was pernicious in type. The prompt administration of nivaquine and the application of other measures that were being used with such success at Hoa-Binh were successful in restoring the situation and averting what threatened to be a most disastrous epidemic. *Norman White*

Baugé, R. Étude statistique sur 18,972 recherches d'hématozoaires pratiquées en trois ans (1950–1951–1952) dans la région de Hongay (Nord Viêt-Nam). [**Statistical Results of 18,972 Blood Examinations for Malaria Parasites during the Three Years 1950–52 in the Hongay Region, North Viet-Nam**] *Extrême-Orient Méd.* Hanoi. 1953, Jan.–Mar., v. 6, No. 1, 104–10.

The hospital in Hongay, North Viet-Nam, has 254 beds, 54 of which are reserved for military patients. A routine blood examination for malaria parasites is carried out on all patients, both civil and military, admitted to hospital, whatever the cause of admission may be. During 3 years, 1950–52,

the total number of blood examinations so made was 18,972. Of these 2,708 were of military patients: parasites were found in 554. Of 15,964 civil patients examined parasites were found in 2,046. The species parasite distribution in the combined 2,600 positive findings was *P. vivax* 1,608, *P. falciparum* 720 and *P. malariae* 272.

[It is not possible to obtain information of much epidemiological interest or importance from the data supplied.] *Norman White*

Shibata, S. **A Comparative Study of the Recent Malaria Epidemics in Japan and Lower Yangtze Valley District.** Reprinted from *Bull. Yamaguchi Med. School.* 1953, v. 1, No. 2, 86–99, 5 figs. [14 refs.]

Examination of a small sample of the 6 million people repatriated to Japan at the end of the war suggests that about 22 per cent. or 1,270,000 might be infective sources of malaria. Despite this large reservoir only 75,000 new infections occurred throughout Japan in the following years, and there has been no sign of an epidemic outbreak despite the similarity of surroundings to those of the malarious Yangtze Valley whence many of the repatriates come. The author set out to analyse the reasons but does so exclusively on an examination of the nature of the relapse and recurrence pattern following the methods he has previously devised [this *Bulletin*, 1952, v. 49, 841]. The common patterns for *Plasmodium falciparum*, *P. vivax* and *P. malariae* in the Yangtze Valley are described in detail and happenings in Japan appear to come from the same mould. It is concluded that there is no special feature of malaria in the repatriated people as a cause of the failure of epidemic occurrence which must lie in other factors.

G. Macdonald

Callot, J. Fluctuations dans la faune culicidienne. [**Fluctuations in Mosquito Populations**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 289–92.

The author finds it difficult to accept Roubaud's explanation of the fluctuations in mosquito populations in Vendée, France [this *Bulletin*, 1954, v. 51, 4]. In the case of *Culex modestus*, its appearance may be due to a simple northward extension of its normal range or to the fact that hitherto most entomologists have been interested in anophelines and *C. modestus* has been missed among the mass of other culicines. Other examples are quoted from other parts of France.

Regarding the mosquitoes of the *Anopheles maculipennis* complex, it is certain that malaria existed in Vendée before the German occupation and that *A. m. atroparvus* was present, but so it appears was *A. m. messeae*. The general theme of the author's argument is that *A. m. messeae* is not a newcomer to this area since barred eggs had already been recorded in 1934 at Beauvoir not so very far from the places investigated by Roubaud. Also in 1937 *A. m. messeae* was recorded from Pornic, a little further north.

Referring to changes in animal populations the author suggests that it would be of interest to compare precise figures for such changes in Vendée and in Alsace. Modern methods of dairy farming and the resulting suppression of mosquito breeding places are among the "involuntary" causes of the disappearance of endemic malaria, and it is known that in some villages cattle are 10 times as numerous today as they were in 1912.

H. S. Leeson

Misra, B. G. **Incrimination of Malaria Vector in Tripura and Manipur States.** [Research Notes.] *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1954, July, v. 2, No. 4, 151–2.

The author quotes previous records of anophelines found in Tripura and Manipur States, which indicated that *A. minimus* formed 10 per cent. of total collections among 9 species in Tripura but was absent from the 16 species collected in Manipur.

Both States were surveyed for malaria vectors in April–May 1954. On one day in May, 71 *A. minimus* were caught in houses of hill tribes in a small village (Howaibari) 30 miles north-east of the capital. Of 50 dissected 2 were positive for sporozoites: both were collected beneath a bed in a house where a positive case of malaria had been found. Later 29 more *A. minimus* were collected in this village, but all were negative for sporozoites. Spleen and parasite rates of children were 91 and 59 per cent. and the infant parasite rate was 58·5 per cent.

In Manipur State, 20 specimens of *A. minimus* were collected from houses in Torbung, a village in the foothills 32 miles south-west of the capital. One specimen was heavily infected with sporozoites. The spleen rate in children was 60 per cent. and a few cases of "fever" were seen.

A. minimus was therefore established as a malaria vector in both States.

H. J. O'D. Burke-Gaffney

Ramírez Aguilar, N. Especie anofelina predominante en el oriente ecuatoriano. [**Predominant Anopheline Species in Eastern Ecuador**] *Bol. Oficina Sanitaria Panamericana.* 1953, Nov., v. 35, No. 5, 499–504, 1 fig. English summary (7 lines).

The English summary appended to the paper is as follows:—

"From 7 July to 20 November 1952, the Southern Antimalaria Service of Ecuador captured and classified 3,116 *Anopheles* in various localities of Santiago Zamora Province. Of the total number of *Anopheles*, 88·10% were of the *A. rangeli* species; 6·48% *A. eiseni*; 1·70% *A. mediopunctactus*; 1·50% *A. neivai*; 1·50% *A. punctimacula*; 0·54% *A. albimanus*; 0·03% *A. vargasi*; and 0·03% *A. oswaldoi*. From these figures, the author concludes that *A. rangeli* is the predominant species in the eastern part of Ecuador."

Gallais, P., Cros, R., Lévy-Cavalleri, V. & Sentilhes, L. Aspect de l'immunité palustre des Africains de l'Union Française. Impaludations thérapeutiques comparées chez des Blancs et des Noirs. [**Sidelight on Malarial Immunity of Africans from the French Union. Malarial Therapy of Whites and Africans compared**] *Méd. Trop.* Marseilles. 1953, July–Aug., v. 13, No. 4, 495–503, 4 charts.

This paper is prefaced with some reflections regarding the nature of malarial immunity. The immunity generally developed by the native populations of endemic areas of Indo-China is for the most part only operative against local strains of the species of malaria parasite concerned. Transferred elsewhere they show little or no resistance to infection with other strains of the same species, let alone to other species. The immunity displayed by Africans from French territories in Africa is much more solid. During the war in Indo-China French and Vietnam soldiers occasionally fell victims to malaria despite the general success of the antimalarial measures

enforced. An attack of malaria among the numerous African troops employed in the campaign was never observed.

A further striking illustration of the African's resistance to infection is furnished by the account given of the attempted malaria therapy of two African neurosyphilitic patients. All attempts to infect them with either *P. vivax* or *P. falciparum* failed: very large infecting doses were administered. Control French patients infected simultaneously with the same strains of *P. vivax* gave ample proof of the pathogenicity of the strains used. The high degree of antimalarial immunity attained by these Africans failed to give any protection against the development of neurosyphilis.

Norman White

Allison, A. C. **The Distribution of the Sickle-Cell Trait in East Africa and Elsewhere, and its Apparent Relationship to the Incidence of Subtertian Malaria.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, July, v. 48, No. 4, 312–18. [31 refs.]

The sickle-cell trait incidence in 35 East-African tribes is surveyed, and there is a remarkably good correlation between this trait and the degree of malarial infection. All the tribes from regions where malaria is hyperendemic had an incidence of more than 10 per cent. of the trait, whereas in tribes from areas where malaria is epidemic or absent the incidence of the trait was less than 10 per cent. Lehmann and Raper [see this *Bulletin*, 1950, v. 47, 267] had pointed out that sickling incidence was low in "Hamites" and in Bantu-speaking people was lower the more they were allied to Hamites. These facts are not contested, but Hamites are cattle owners and tend to live in non-malarious regions. The author refers to the possibility that the sickle-cell trait may confer a natural resistance to malaria and that therefore the trait will survive more successfully the more severe the malarial infection rate. This factor rather than the anthropological classification of a tribe should be considered decisive. [While it is important not to over-emphasize the anthropological background of the sickling phenomenon, the same must be said for the connexion between the trait and malaria. Can one really draw such a strict line between epidemic and hyperendemic regions? The "yellow" pygmies of the Ituri forest have the same surroundings as some of the tribes with the highest sickling incidences recorded, yet they have no sickle cells; the Upper Nile Nilotes of Uganda show a high sickling incidence, yet the neighbouring Southern Sudanese Nilotes do not. Similar examples can be quoted for the Nilgiri Hills of India and for Greece.] *H. Lehmann*

Logan, John A., with the collaboration of Aitken, T. H. G., Casini, G. U., Knipe, F. W., Maier, J. & Patterson, A. J. **The Sardinian Project. An Experiment in the Eradication of an Indigenous Malarious Vector.**

This book was reviewed on p. 1019.

Roubaud, E. & Toumanoff, C. Déplacements des anophèles consécutifs aux traitements larvicides. [**Displacement of Anophelines as a Result of Larvicidal Measures**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 91–7.

During an antimalarial campaign in Sardinia in 1946 it was found that insecticidal treatments in the valleys and plains was causing a displacement

of the adult population of *Anopheles maculipennis* towards the mountains. This was an effect which had to be seriously considered in the carrying out of similar operations in Corsica.

In August 1947, before the compaign in Corsica was started, one of the authors investigating at about 1,700 ft. was unable to find any anopheline of the *maculipennis* group. In October and November a very few were found at heights between 700 and 1,700 ft.

After 2 years of continuous treatment against both adults and larvae reports showed that *A. maculipennis* had become rare at lower altitudes but was frequently encountered in the mountain regions at about 2,100 ft.

It is considered that one of the chief reasons for this displacement was the rejection by gravid females of a water surface that had been treated with larvicide, the results being a general movement to untreated breeding places at higher altitudes. *Anne Hudson*

Livadas, G. A. **On Public Health Hazards resulting from the Weakening of Residual Insecticide Action, and the means of preventing them.** *Riv. di Malariologia.* 1954, June, v. 33, Nos. 1/3, 23–32.

This speech recounts the history of malaria control in Greece since the war by the use of DDT as an anopheline larvicide and imagocide. The original brilliant success continued until 1951 when failures first appeared; they have since multiplied and appear to be due to the development of resistance by *Anopheles sacharovi* to insecticides. In 1952 there were 399 known positive cases of malaria in the country, in 1953 there were 1,392 and of these 111 were due to *P. falciparum* infections. A revival of the disease throughout the country is feared. However, the reservoir has been greatly decreased and knowledge of prophylactic drugs has accumulated. The disease could be kept in check by a combination of a diagnostic-therapeutic service with continuation of insect control. A complete overhaul of the malaria service would be necessary and much help would be needed from outside sources, but an intensive effort could prevent the recrudescence of the old plague of Greece. *G. Macdonald*

Belios, G. D. **Short-Term Inactivation of Residual Spraying with DDT, resulting from Anopheline Resistance.** *Riv. di Malariologia.* 1954, June, v. 33, Nos. 1/3, 33–45, 1 map. [14 refs.]

The combined larvicidal and imagocidal use of DDT from 1945 in Greece resulted in the development of resistance, first by *Musca domestica*, then by *Culex molestus*, *Pulex irritans*, *Cimex lectularius*, and later by *Anopheles sacharovi*. In 1953 the author made a detailed survey of 33 villages in an effort at indirect measurement of the degree of resistance acquired by the malaria carrying anophelines. This was based on an estimation of the adequacy of recent spraying; a measurement of the ratio of anophelines in sprayed and unsprayed houses; and an analysis of the recently occurring malaria cases. Spraying was considered to have been adequate in 17 villages and acceptable in 6; resistance was estimated as being very strong or strong in 12 villages, and moderate in 12; it was most marked in *A. sacharovi* but present in *A. superpictus* and *A. maculipennis*; recent malaria cases had occurred in 11 villages, there being 84 proven cases of which 79 were due to *Plasmodium vivax* and 5 to *P. falciparum*. It is concluded that resistance has developed and that autochthonous primary malaria infections did occur after and in spite of recent and adequate house spraying. [The demonstration of the occurrence of fresh malaria despite

recent spraying seems definite, as does the appearance of resistance, but the measurement of resistance is based entirely on indirect measurements not all of which will be accepted as valid by workers elsewhere. No data are given on the formulation of DDT used; the assumed rate of disappearance and standard of adequacy are open to discussion, while the use of anopheline counts in estimation of insecticide efficacy has been abandoned by many workers elsewhere. It is very desirable that the work should be amplified by direct objective measurement of the susceptibility of the insects to DDT, for which adequate techniques have been developed.]

G. Macdonald

Jaswant Singh & Ray, A. P. **Studies on Experimental Mixed Infections in Simian Malaria.** *Indian J. Malariology.* 1952, Dec., v. 6, No. 4, 449–56, 4 charts.

Two rhesus monkeys were inoculated intravenously with $2{\cdot}5 \times 10^6$ trophozoites of *Plasmodium cynomolgi* per kgm. body weight, and two others with double the dose; 4 more with a similar dosage of *P. inui*; lastly 2 others received mixed infections of $2{\cdot}5 \times 10^6$ per kgm. of *P. cynomolgi* and the same amount of *P. inui*. Parasite counts were made and when the infections were unmixed, parasites were detectable on the day following inoculation. Doubling the dose increased the intensity of the infection at its peak. In the mixed infections, *P. cynomolgi* showed the same course, but the prepatent period of *P. inui* was delayed by 5 days, its peak was lowered, and it was largely suppressed in the following weeks. Splenectomy enhanced the intensity of infection with both species and caused a rapid and parallel increase in parasitaemia. The periodicity of both species, as determined by counting mature schizonts, was of the usual type and showed major and minor broods. These experiments show how *P. cynomolgi* tends to suppress *P. inui* except in splenectomized animals. *P. C. C. Garnham*

Huff, C. G. **Changes in Host-Cell Preferences in Malarial Parasites and their Relation to Splenic Reticular Cells.** *J. Infect. Dis.* 1954, Mar.–Apr., v. 94, No. 2, 173–7.

This paper gives an interesting account of the author's views about why the exo-erythrocytic stages of avian malaria parasites live first in one type of cell and then in another; the pattern of infection in general is the same, though minor variations are produced by differences in the host, strains of parasite, etc. When sporozoites of *Plasmodium gallinaceum*, *relictum*, *cathemerium*, *lophurae* and *fallax* are introduced into a bird, development takes place whether in the local macrophages or in distant sites, notably in the reticular cells of the Schweigger-Seidel sheaths of the spleen. When heavy doses of blood forms of *P. gallinaceum* are inoculated into chicks, *P. fallax* and *P. lophurae* into turkeys and *P. cathemerium* into canaries, exo-erythrocytic parasites are found not earlier than 4 or 5 days in the same reticular cells of the spleen. Then later, in both instances, the endothelial cells of the venules and capillaries of many organs become invaded, and it is suggested that this "conversion" of host cell predilection is due to a preliminary conditioning of the parasite by the splenic reticular cells. This process might be facilitated either by the anaemia which develops during the disease, or by the mounting immunity—the latter is thought to be the more likely cause, particularly as the spleen cells are known to be an important site of antibody production, and harbour at the same time the early exo-erythrocytic parasites. *P. C. C. Garnham*

Jaswant Singh, Krishnan, K. S. & David, A. **Natural Infection of *P. relictum* in Weaver Bird, the Baya** (*Ploceus philippinus*). *Indian J. Malariology.* 1952, Dec., v. 6, No. 4, 471–3.

During 1952, 24 pigeons and 23 red munias were examined for malaria with negative results; 220 house sparrows showed an incidence of 15 per cent. of *Plasmodium relictum* and 14 weaver birds (*Ploceus philippinus*) showed an incidence of 14 per cent. of the same parasite in low density. The number of merozoites in the parasite of the weaver bird varied from 7 to 12 per schizont, the nuclei of the host cells were displaced, the infection was readily transmitted to sparrows but not to pigeons or red munias, and *Culex fatigans* became easily infected (100 per cent. in the mid-gut and 50 per cent. in the salivary glands). *P. C. C. Garnham*

Baranger, P. & Filer, M. K. Action comparée des alcaloïdes du quinquina, des remèdes synthétiques modernes et de quelques dérivés minéraux ou organiques simples sur *Plasmodium gallinaceum*. [Miscellanea.] [**Comparison of the Activity of Cinchona Alkaloids, of New Synthetic Agents and of Simple Mineral or Organic Substances on** *P. gallinaceum*] *Acta Tropica.* Basle. 1954, v. 11, No. 2, 153–8.

The authors have continued their investigations on the effect of mineral or simple organic substances on *P. gallinaceum* infections in chickens, including triuret, urotropine (hexamethylene tetramine) potassium nitrate and metallic silver. The activities of these substances have been compared with those obtained with total extract of cinchona and of recent synthetic antimalarials of proved value. Results obtained with the extract have already been reported by the authors against erythrocytic and exo-erythrocytic forms of *P. gallinaceum* [this *Bulletin*, 1951, v. 48, 716] and also the effect of the presence of metallic substances in the form of necklaces, on parasitaemia in the same infection [*ibid.*, 1953, v. 50, 684].

The infections were studied in 6-day-old male chicks following intravenous injection of blood forms or sporozoites. Drug was administered in the former case a few hours after infection and then twice per day on 3 successive days. In sporozoite infections 12 doses of drug were given during 6 days, the first dose preceding the infection. Activities of the various substances against the erythrocytic and exo-erythrocytic forms are recorded in 2 tables. The authors' conclusions are that under the experimental conditions the antimalarial activity of total alkaloids of quinine is greater than that of the newer synthetic substances against both erythrocytic and exo-erythrocytic forms of *P. gallinaceum*. They believe that the action of simple substances, such as iron sulphate, potassium nitrate, manganese chloride, copper, silver, urea, cyanuric acid, urotropine and triuret, compares favourably with that of synthetic substances, in particular against exo-erythrocytic forms. *J. D. Fulton*

Manwell, R. D. & Khabir, P. A. **Further Studies in the Chemotherapy of *Plasmodium hexamerium* Infections in Ducks.** *J. Protozoology.* Utica. . 1954, May, v. 1, No. 2, 105–10, 10 figs. [13 refs.]

The authors undertook an intensive study of the effect of chloroquine, paludrine (proguanil, chlorguanide), pyrimethamine (daraprim), pentaquine and isopentaquine, on *P. hexamerium* infection in ducks. The methods used were similar to those in a previous study [this *Bulletin*, 1953, v. 50,

604] in which drugs were given orally twice a day for 7 days in amounts based on body weight of the host. The ducklings were infected by intravenous inoculations with parasitized blood when a few days old. A total of 36 birds was generally used in each test with a single drug, 12 serving as controls, while 12 others were treated a few hours after inoculation and the remainder on the 7th day when the infection was well established. After treatment there was an observation period of 30 days. Then, in absence of infection, the spleen was removed and the host was examined for a further similar period. The effectiveness of a drug was judged by ability to sterilize infection and by the speed at which sexual and asexual parasites were caused to disappear from the blood.

The 2 pentaquines proved about equally effective and they alone were able to sterilize the infection with only a trifling number of relapses. They also cleared the blood of sexual and asexual forms very effectively. The remaining 3 drugs failed to eradicate infection and cleared the blood of parasites more slowly than the pentaquines. Chloroquine was the most effective of the 3; proguanil and pyrimethamine appeared to act selectively on asexual stages. The pentaquines and pyrimethamine proved most toxic and even in moderate dosage permanently prevented the host from gaining weight. The latter substance also interfered with feathering.

J. D. Fulton

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed*:—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

See also p. 1207, East Africa High Commission. **East African Tsetse and Trypanosomiasis Research and Reclamation Organization. Annual Report 1953.**

See also p. 1209, Moçambique, Missão de combate às tripanossomíases. Relatório anual de 1952 [**Annual Report for 1952 of the Trypanosomiasis Commission**]

Maillot, L. Les variétés de *Glossina palpalis* en Afrique Équatoriale Française. [**Varieties of** *Glossina palpalis* **in French Equatorial Africa**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 1066–80, 13 text figs. & 6 figs. on pl. [22 refs.]

[There has of recent years been apparent in applied entomology an increased interest in forms below specific rank. This has arisen in part from the revival of interest in taxonomy, but also from an appreciation of the importance of the differences in biology and behaviour which sometimes accompany the small morphological differences by which sub-specific forms are separated, and in particular the effect these may have on capacity to transmit disease. This tendency has been reflected in research on tsetse by the description during the last half dozen years or so of a number of new forms and varieties of those widespread and important vectors of human

and animal disease, *Glossina palpalis* and *G. morsitans.*] This paper reviews briefly the various forms of *palpalis* which have been described both on grounds of external morphology and on the characters of the genitalia; a useful table summarizes the author's views on their equivalence. He reduces them to 4 different forms, which he calls varieties:—*G. palpalis palpalis* of Robineau-Desvoidy, *G. p. fuscipes* of Newstead, *G. p. martinii* of Zumpt [see this *Bulletin*, 1935, v. 32, 722], and *G. p. quanzensis* of Pires (*Moçambique*, 1948, v. 53, 133). He then considers in detail the forms which are to be found in French Equatorial Africa, again considering characters both of external morphology and of the genitalia. Of the forms based on the genitalia one, occurring in the coastal regions of the west, he identifies with *G. p. palpalis*; the second, found in the northern portions of his region, with *G. p. fuscipes*; the third, from the more southern areas, with *G. p. quanzensis*. He does, however, consider that the second is better regarded as a distinct species, *Glossina fuscipes*, as, indeed, it was originally described; the third he ranks as a sub-species of this. The differences in the genitalia of these forms he shows by simple, clear line drawings, and by photographs.

The distribution of the 4 forms he recognizes is shown somewhat diagrammatically on a small outline map of Africa, while that of the 3 forms occurring in French Equatorial Africa is described in some detail; he suggests that it is to some extent controlled by various factors of a topographical nature and indicates the points of contact which exist between the various forms.

In discussing the possibilities of hybridization between these forms he describes failure to obtain adult offspring from crosses between the western and northern forms, and concludes that there is no evidence of intercrossing in nature, except between the two which he regards as subspecies of *G. fuscipes*. He discusses this phenomenon in relation to its possible use in control, and to the transmission of sleeping sickness, but considers that here our knowledge is still too fragmentary to allow firm conclusions. He reviews the relation between the 3 forms and the intensity and distribution of human trypanosomiasis in French Equatorial Africa, and concludes that no one form can be regarded as a better transmitter than either of the others.

W. H. Potts

Hoffmann, R. Zur Fortpflanzungsbiologie und zur intrauterinen Entwicklung von *Glossina palpalis*. [**The Biology of Reproduction and Intra-Uterine Embryonic Development in** *Glossina palpalis*] *Acta Tropica*. Basle. 1954, v. 11, No. 1, 1–57, 43 figs. [18 refs.]

The author has made a comprehensive and valuable contribution to a comparatively neglected aspect of tsetse biology; since the classic observations of Roubaud in 1909 and 1919 [see *Bull. Sleeping Sickness Bureau*, 1908–1909, v. 1, 126 and this *Bulletin*, 1920, v. 15, 160], and of Newstead in 1918 [see this *Bulletin*, 1919, v. 13, 50] on the reproductive cycle of *Glossina* and the intra-uterine life of its larva, the only contributions to this subject have been those of Mellanby and Mellanby in 1936 and 1937 [see this *Bulletin*, 1937, v. 34, 558, 559, 560 and 924], Jackson in 1948 [*ibid.*, 1949, v. 46, 336 and 1950, v. 47, 17] and Burtt and Jackson [*ibid.*, 1951, v. 48, 530].

This paper, after a review of existing knowledge on the subject, describes in varying degrees of detail the reproductive organs of the female fly; intra-uterine embryonic development, including maturation of the eggs, their

fertilization and hatching of the larva; intra-uterine development of the larva which is taken right up to the process of birth. The author also records observations on copulation in the laboratory, and finally synthesizes the course of reproduction in *Glossina palpalis*, describing the cycle of a generation. To these he adds a bibliography of nearly 20 works and summaries in German, French and English.

As well as confirming much previous work, he makes a number of additions to our knowledge. Among these we may note the overpowering of the feeding reaction by the copulation reaction in newly emerged flies in the laboratory [contrary, it may be noted, to earlier views of Roubaud]; the observation that milk is secreted only for a period of 2–3 days instead of continuously throughout intra-uterine development, though its production is described as being considerably extended in the first pregnancy; observations on the importance to the development of normal larvae of the timing of, as well as the amount of, the blood meals of the female, which extend the initial work of H. Mellanby in 1937 [*loc. cit.*] and Jack [see this *Bulletin*, 1939, v. 36, 1040]. A feature of considerable interest is the continued production of larvae of greater weight than that of " wild " ones; it is also worthy of note that the earlier larvae produced are actually rather under the normal weight, and that it is not until the culture of the females has been established for a little while that this is attained and exceeded. In this connexion tribute must be paid to the remarkable record of 92·4 days for the average length of life of over 60 females and of the production by them of an average of a little over 9 larvae per female; these are quite unprecedented figures for tsetse in captivity. This achievement of what must be considered as normal reproduction, with optimal weight larvae, under laboratory conditions (other than by individual feeding of flies kept in single tubes) is of great practical importance, and constitutes a most valuable contribution to tsetse research, so far much hampered by lack of normal material for laboratory work; it is now of prime importance to see whether application of these methods to species other than *palpalis* will meet with the same success, or whether this species is unique in its adaptability to domestication.

A feature of interest is his independent discovery, at nearly the same time, of the choriothete described by Jackson [see this *Bulletin*, 1950, v. 47, 17], whose description he confirms, and with whose interpretation he agrees, and at the same time extends further by suggesting a secretion by this organ which dissolves, though not completely, the empty egg shell and larval skins. It is also interesting that he should find no egg tooth in *G. palpalis*, for this has not only been described but also photographed by Jackson in *G. swynnertoni* [*loc. cit.*]; should this structure prove to be absent also from the other species of the *palpalis* group, yet another striking difference between them and the other species of tsetse will have been revealed.

The problem of the respiration of the larva is touched on, the author describing the mechanism by which access of air is allowed to the polypneustic lobes of the larva *in utero*, but it seems to the reviewer that further work is needed before we can have a full understanding of larval respiration, for there is as yet no adequate explanation for the complex structure of these lobes, which are said to cease to function as respiratory organs once the larva leaves the uterus.

It should be mentioned that this work has been carried out on the cultures of *Glossina palpalis* maintained by Professor Geigy at Basle from female flies originally imported from Brazzaville. The author does not state the temperature at which his observations have been made, but

reference to Geigy's description of these cultures [see this *Bulletin*, 1949, v. 46, 122] suggests that this will be 26°C. If this is correct, the periods recorded for length of pupal development show an interesting divergence (as also did those earlier given by Geigy [*loc. cit.*]) in their relation to temperature from those known for other species of tsetse, including *G. palpalis fuscipes* [see this *Bulletin*, 1935, v. 32, 369; 1937, v. 34, 558; 1939, v. 36, 1040; 1948, v. 45, 873].

A welcome feature of this paper is the very full particulars given of the whole series of individual flies on which observations are based; this is a most commendable procedure and one all too little followed in tsetse literature. *W. H. Potts*

Roubaud, E. Expériences d'intercroisement de glossines (tsé-tsés) du groupe *Gl. palpalis*, effectuées à l'Institut Pasteur de Paris. [**Studies in Inter-Crossing of Glossinae of the** *G. palpalis* **Group carried out at the Paris Pasteur Institute**] *Ann. Inst. Pasteur.* 1954, May, v. 86, No. 5, 537–60, 4 figs. [12 refs.]

In this paper the author presents observations on the inter-crossing of two forms of *Glossina palpalis;* on these he bases an interesting discussion of the bearing of such work both on taxonomic problems and on the possibilities of using these phenomena in control of this and other insects. In the course of the discussion he reviews previous work of this nature on *Glossina*, giving incidentally an early and previously unpublished experience of his own.

The two forms used by him were *Glossina palpalis palpalis* from Yaoundé in the French Cameroons, and *G. palpalis fuscipes* var. *quanzensis* from Brazzaville. Although the observations are based on a limited number of flies, they are valuable because of the detail in which it has been possible to study and record each case. From these observations he concludes that in addition to a certain degree of morphological incompatibility between the two forms a more fundamental bar to reproduction between them is to be found in the failure of the heterologous spermatozoa to survive in the genital ducts and spermathecae of the female. The morphological incompatibility he found to be less than that described by Vanderplank in *G. palpalis fuscipes* and *G. p. martinii* [see this *Bulletin*, 1949, v. 46, 18], for of 29 females crossed only 8 died prematurely as a result of the heterologous pairing. In view of the fundamental bar he suggests that the specific distinctness of these two forms may have to be reconsidered, but concludes that this must await further experiences of intercrossing between the different forms of the *palpalis* group, and particularly between the *martinii, fuscipes* and *quanzensis* types.

Among other interesting points which emerge from this paper may be noted the observation that the male offspring show the characters of the maternal parent, whereas the females show that of the father; this is different from the experience of Vanderplank with *G. swynnertoni* and *G. morsitans* which showed both sexes to be of the *swynnertoni* type, though here Vanderplank differed from Corson who considered the *morsitans* characters to be dominant. The author also demonstrated that there was no " psychological " barrier to these cross-matings, for whether pairing was effected depended only on the age and physiological condition of the females, and not on the racial nature of the pairs. The same has been observed in the case of *G. morsitans* and *G. swynnertoni*, both in the laboratory [Vanderplank, see this *Bulletin*, 1945, v. 42, 99] and in the

field [Jackson, see this *Bulletin*, 1946, v. 43, 420]. He also noted that there is greater difficulty in production of offspring from the cross in one direction than in the other, for none resulted from the pairing of 6 females of *G. palpalis palpalis* with 5 males of *G. palpalis fuscipes* whereas 6 F^1 generation (2 males and 4 females) were produced by two of the five *G. palpalis fuscipes* females that had been mated with 4 heterologous males. It was found impossible, however, to obtain a second generation from these hybrids. In an interesting discussion on the possibilities of using these phenomena for control the author compares them with those recorded in mosquitoes and suggests that here an interesting field for investigation has been opened.

[The reviewer must confess that he would like to see stronger evidence that the absence of spermatozoa from the spermathecae and genital ducts of females crossed with heterologous males is due to their having disappeared and not because they were never introduced; it has been his experience that coitus of quite long duration can be followed by failure of insemination even in homologous pairings and in some cases at least dissection followed closely on pairing; the fact that the phenomena have been known to occur in homologous pairings also makes it less probable, though not impossible, that the spermatazoa died out; at least one instance where this did occur after production of larvae had proved their initial introduction is known to the reviewer, so it is obvious that the matter requires further investigation.]

W. H. Potts

Desowitz, R. S. **Studies on *Trypanosoma vivax*. X.—The Activity of some Blood Fractions in facilitating Infection in the White Rat.** *Ann. Trop. Med. & Parasit.* 1954, June, v. 48, No. 2, 142–51, 5 figs.

"1. The active component of the plasma supplement is shown to be protein.

"2. A number of distinct bovine plasma proteins have the ability to act as supplement in facilitating the infection. The proteins demonstrated to show this activity are fibrinogen, albumin and gamma-globulin.

"3. Fraction VI (acid glyco-protein and polypeptide plasmin inhibitor) and fraction G2/3 (gamma- and beta-globulins) both failed to act as supplement. The failure of fraction G2/3 may be due to its lack of solubility.

"4. By the use of bovine fibrinogen and crystallized albumin it is shown that the degree of parasitaemia produced in the rat following the administration of supplement is dependent upon the amount of protein in the supplement."

Unsworth, K. **Observations on Antrycide-Fast Strains of *Trypanosoma congolense* and *T. vivax*.** *Ann. Trop. Med. & Parasit.* 1954, June, v. 48, No. 2, 178–82, 1 graph.

Alwar, V. S. & Ramanujachari, G. **Cultural Experiments with *Trypanosoma evansi* in Chick Embryo—a Preliminary Report.** Reprinted from *Indian Vet. J.* 1952, Sept., v. 29, No. 2, 113, 2 figs. on pl.

Alwar, V. S. & Ramanujachari, G. **Observations on the Behaviour and Transmissibility of *Trypanosoma evansi* in Infected Hatched-Out Chicks.** Reprinted from *Indian Vet. J.* 1953, Mar., v. 29, No. 5, 383–7, 1 chart & 1 fig. on pl.

MEYER, Hertha & PORTER, K. R. **A Study of *Trypanosoma cruzi* with the Electron Microscope.** *Parasitology*, 1954, May, v. 44, Nos. 1/2, 16–23, 17 figs. on 5 pls. [15 refs.]

A description is given of the finer structure of *Trypanosoma cruzi*, all stages of which—developing in cultures on NNN medium and in tissue cultures on embryonic chick brain and spleen—were examined by electron microscopy, in films freed of extraneous proteins, fixed with osmic acid, and washed repeatedly with distilled water.

The details revealed by the electron microscope are depicted in a series of micrographs. Except for the presence of spherical bodies of a lipid nature, the inner structure of the body of the flagellates cannot be seen owing to its opacity, but the outer part of the cytoplasm appears to be covered by a spirally striated layer, externally to which is a fine membrane or pellicle enveloping the entire body. It is thought that the striation is produced by protein fibres which, being contractile, are responsible for the movements of the body. The flagellum consists of an outer sheath and an inner axoneme made up of a bundle of 5–9 fibres, which are said to be contractile, being operated by waves of contraction starting at the tip and running in a spiral direction down the flagellum, to which they convey a spiral motion. *C. A. Hoare*

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

WINCKEL, W. E. F. & AALSTEIN, M. **Contribution to the Geographical Pathology of Surinam. First Case of Kala Azar in Surinam.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, Dec., v. 5, No. 4, 399–42, 2 figs. [14 refs.]

Kala azar has been found in Brazil and Venezuela, so that it was extremely probable that it would also be found in the Guianas. The authors report the first case from Surinam.

The subject was a European, aged 41 years, who had been in that country (or in any tropical country) for only 5 months when he first became ill with a sharp febrile attack that lasted a few days. He continued to suffer from intermittent fever without any other subjective complaints for 4 months during which period he became increasingly ill and anaemic; he then died.

The spleen and liver showed increasing enlargement during the illness. Terminal haemorrhages occurred in the skin.

The outstanding laboratory findings at the outset were a high ESR, slight anaemia (Hb 12 gm. per cent.) and leucopenia (2,800 per cmm.). The abnormal findings persisted. All other examinations, including sternal puncture, yielded only negative results.

At autopsy, the spleen and liver were found to be considerably enlarged and haemorrhages were found in the skin, lungs and bronchial mucosa.

Microscopical examination of the liver and spleen showed marked proliferation of the reticulo-endothelial elements with macrophages crammed with *Leishmania*. "The lymphatic nodes, kidneys and lungs held the same aspect. It was remarkable that in the lungs macrophages filled with *Leishmaniae* were found in all alveolar septa." *L. E. Napier*

Tapie, J., Laporte, J., Monnier, J., Ferret, Moreau & Voisin, R. Splénomégalie fibro-congestive avec anémie, séquelle irréductible d'un kala-azar; action spectaculaire de la splénectomie. [**Fibro-congestive Splenomegaly with Anaemia as a Sequel of Kala Azar; Spectacular Effect of Splenectomy**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1954, Nos. 17/18, 574–9.

Report of a case.

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

American Geographical Soc. **World Distribution of Rickettsial Diseases. 3. Tick and Mite Vectors.** *Atlas of Diseases.* Plate 12 (6 coloured maps on folding pl.). [Numerous refs.] 1954. New York 32: Broadway at 156th Street. [$1.25.]

This is the 12th large plate of the Atlas of Diseases which is being published in serial form by the American Geographical Society. It is the last of the 3 sheets which illustrate the geographical distribution of the human rickettsial diseases; it deals with the ticks and mites which are known to be most effective in transmission of these diseases. There are 5 maps on a scale of 1 in 30,000,000; in each of these the known distribution of the chief vectors of the area is clearly displayed.

In the map of North America the vectors shown are *Amblyomma americanum*, *A. cajennense*, *Dermacentor andersoni*, *D. variabilis* and *Allodermanyssus sanguineus*. In South America *Amblyomma brasiliense* and *A. cajennense* are shown. In the combined map of Europe and Asia the following species are dealt with: *Dermacentor nuttallii*, *D. silvarum*, *Haemaphysalis concinna*, *Hyalomma dromedarii*, *H. excavatum*, *H. savignyi* and *Trombicula akamushi-deliensis* complex. The species in Africa are: *Amblyomma hebraeum*, *Hyalomma dromedarii*, *H. excavatum*, *H. savignyi*, *Rhipicephalus appendiculatus*, *R. evertsi*, *R. simus* and *Allodermanyssus sanguineus*. In Australia and the Pacific Islands there are *Dermacentor variabilis*, *Ixodes holocyclus* and *Trombicula akamushi-deliensis* complex. In a small map of the world the distribution of *Rhipicephalus sanguineus*—which is extensively distributed in every continent—and of *Haemaphysalis leachi*, is shown separately.

The name *Trombicula akamushi-deliensis* complex is used because of doubts as to whether one or two species are included in this group.

The whole of the back of the sheet is occupied by an extensive bibliography of the sources of the information from which the map was prepared and by a résumé of the natural history of 60 selected species of vectors of which there is an alphabetical list in tabular form showing the common hosts, the diseases conveyed, the importance as a vector and the geographical distribution of each.

Even when full allowance is made for the large size of the plate it is obvious that high standards of skill and industry have been needed for the inclusion of so great a store of information in a single sheet.

The whole reported range of distribution of each vector is shown irrespective of whether transmission is known to occur throughout the area. The map therefore shows the areas of potential occurrence of transmission, as far as is known at present. *John W. D. Megaw*

KUBÁSEK, M. Queenslandská horečka v Československu. [**Q Fever in Czechoslovakia**] *Časopis Lékařů Českých*. Prague. 1954, Apr. 30, v. 93, No. 18, 474–5, 10 figs. on 2 pls. [10 refs.]

An epidemic of acute febrile illness occurred in May 1953 among the employees of a state farm in Czechoslovakia [the locality is not stated]. Fourteen persons became ill within a period of 4 days, and 4 other cases occurred a month later. Twelve of the 18 patients were treated in hospital; 10 showed symptoms of atypical pneumonia and in 1 patient the disease took the form of serous meningitis. The most frequent symptoms were rigors, headache, pain in the chest, anorexia and insomnia. The disease lasted from 4 to 10 days with a mean duration of 8 1/3 days. The diagnosis was established by serological means, and the infection may have originated from an epizootic of broncho-pneumonia which occurred in lambs in the same area in March. *D. J. Bauer*

PLAGUE

ERRATUM

In lines 12, 13 and 14 of the abstract of the paper by HEISCH *et al.* in this *Bulletin*, 1954, v. 51, 264, the figures in brackets refer to the number of tissue pools found infected and not to the number of individual rodents infected.

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

POLLITZER, R. **Cholera Studies. 1. History of the Disease.** *Bull. World Health Organization*. Geneva. 1954, v. 10, No. 3, 421–61. [43 refs.]

The monograph on cholera which Pollitzer has prepared, and which will in the first instance be published in successive parts in the *Bulletin of the World Health Organization*, should form a valuable source of reference for all who may be concerned with the disease. The several parts will be abstracted as they appear.

The first part contains an outline of the known history of cholera and its geographical distribution from the earliest times of which there is any information up to 1923. India is recognized as the most important epidemic area and as the endemic centre from which spread occurs to other parts of the world. There is little doubt that cholera has existed in India from time immemorial. Definite information on its occurrence in historical times

was first furnished by European observers who, after the arrival of Vasco de Gama on the Malabar coast in the end of the 15th century, described epidemics occurring on the west coast of India and later on the Coromandel coast and in Bengal when these areas were reached. It appears certain that no long-distance spread of cholera from India westwards took place before the 19th century. The disease, however, may have reached China in earlier times. Importation into Malacca, Burma and other contiguous countries probably occurred during the 17th and 18th centuries, but the tendency to spread far afield was not marked until the last 3 decades of the 18th century. At that period epidemics were very severe in India and were particularly noted as affecting troops and the pilgrims attending the great religious fairs and festivals.

The year 1817 marks the beginning of a new epoch in the history of cholera during which, in the course of a series of pandemics, spread took place over a great part of the globe and in areas in which the disease had not previously been observed to occur. From being a disease mainly of localized importance cholera became a serious problem of world health.

A summary is given of the 6 successive pandemics which occurred between the years 1817 and 1923 with a description of the countries infected and the lines of spread.

The first pandemic, commencing in 1817 and lasting to 1823, just reached the confines of Europe at Astrakhan. It followed a period of 3 successive years of exceptionally severe incidence in India during which eastward spread occurred to Burma, Ceylon and Siam partly by land and partly by sea, and eventually by sea to Canton and other ports in China and as far as Peking. It is believed to have crossed the Great Wall and eventually to have been carried by caravan to the Russian border. In the east the Indonesian archipelago and Borneo were also infected and the disease reached Japan for the first time. Westward spread is attributed in the first place to infection carried from India by an expeditionary force which landed in Arabia the disease reaching ports on both sides of the Persian Gulf. Epidemics occurred in Persia and the infection introduced at Bassra was carried up by caravan and by boats on the Tigris to Baghdad and also along the Euphrates, reaching the country between the Caspian and the Black Seas. Cholera eventually spread to Syria, reaching Aleppo in 1822 and Alexandretta in the following year and extended to the coast of the Mediterranean. After that cholera died out completely in the areas infected in this western spread. Mauritius was also infected by sea and the disease was carried across from Arabia by dhows and affected a narrow strip of the coast at Zanzibar. Cholera is stated to have died out in Ceylon, Burma and China after a series of 3 or 4 epidemic seasons.

The second pandemic, commencing in 1829, was much more widespread. There appears to be little doubt that India was again the source of infection and that it could not be attributed to recrudescence in the areas infected in the first pandemic. In 1827, after severe epidemics in Bengal, cholera spread to the Punjab, and in 1829 it reached Afghanistan and extended to Bukhara and Khiva and onwards by caravan to Orenburg. Persia and the Caspian were invaded and then Russia and practically every country in Europe as well as North and East Africa. Cholera reached Great Britain by ship from continental ports in 1832, 14,796 cases resulting, these being spread over a wide area. In that year also North America was first infected, the point of entry being the St. Lawrence river. From 1832 to 1836 cholera was rampant in the U.S.A., even spreading across the Rocky Mountains to the Pacific coast. Mexico was invaded and infection reached Cuba from Spain. Details are given of the further advances and recessions,

including the serious incidence in North Africa, Egypt, the Sudan, Abyssinia, the Somali coast and Zanzibar, up to 1835. The pilgrimage to Mecca was infected in 1835 and again later, probably by fresh importation from India. Information on the spread eastward is scanty, but cholera appears to have been prevalent in the Straits Settlements, China and the Philippines.

The third pandemic may be considered to have extended from 1852 to 1859. Spread is attributed partly to repeated reimportations from India and partly to recrudescence in certain areas. Many of the countries affected in the second pandemic again suffered and the lines of spread were, in general, similar. Much of Europe was invaded and also the U.S.A., Mexico and the West Indies. Several parts of Central America were affected and the disease reached south to Colombia and Guiana. To the east China and Japan were severely affected in 1857–59 and the Philippines and Korea also suffered. Spread by sea to Zanzibar was followed by considerable invasion of East Africa. Towards the end of the period cholera died out in Europe, which seems to have been free from the disease at the end of 1859.

The fourth pandemic, lasting from 1863 to 1873, is noted to have spread into the heart of Europe by extension, not so much by the ancient paths through Persia and the Caspian as by sea routes. The pilgrimage to Mecca was infected, and the returning pilgrims carried the disease to parts of Arabia, Mesopotamia, Syria and Palestine, as well as by the sea route to Suez, which was now connected to Alexandria by rail. Alexandria became a centre for dissemination and cholera was carried into several Mediterranean ports, including Istanbul, whence it penetrated north-westwards through Bulgaria, Rumania and the Bukovina. Russia was invaded by several routes, and eventually an area extending from the Caucasus to St. Petersburg and up to the border of Poland was involved. The disease was widespread in France and Spain, the infection entering at Marseilles and other Mediterranean ports. Great Britain was infected, but deaths from the disease did not exceed 14,378, of which 5,596 occurred in London. In 1865 infection was carried from Jeddah to Suakin and Massawa and later extended south-west, reaching Lake Tanganyika and the upper reaches of the Congo river. Zanzibar also suffered and from it Madagascar and the Seychelles were infected. On the west of Africa, spread from Morocco resulted in infection of Senegal and the Gambia. Heavy mortality in the West Indies followed the infection of Guadeloupe by ship from Marseilles. Cholera was severe in the U.S.A. in 1866. Recrudescence occurred in 1867 and the disease continued at intervals up to 1873. Infection was carried to several of the Central American states from New Orleans and reached Uruguay in 1868, and in 1869 spread to Argentina, Bolivia, Peru and Brazil. In the later years of the period Russia and the Balkans suffered considerably and in 1871 cholera was present over much of Germany and Central Europe. In the concluding years of the pandemic cholera was very severe in India, over 364,000 deaths being recorded in 1875. Fresh extensions took place through Persia to Mesopotamia and Egypt. Cholera in Mecca in 1872 was again a source of infection, Suakin being infected with spread to the Sudan. Information on incidence in China is scanty but the disease appears to have been widespread in China and the neighbouring countries.

The fifth pandemic is considered to have lasted from 1881 to 1896 and although covering large areas it was less severe than its predecessors. It was during this period that in 1883–84 the vibrio was first identified by Koch as the cause of cholera. Following severe outbreaks in the Punjab in 1881 infection was carried to Mecca with resulting epidemics in the

following year, Egypt becoming infected in 1883. Sea carriage from Egypt to southern European ports introduced the disease into Italy and Spain, and to France where it reached Paris. Occasional importations into Great Britain took place but effective action by the sanitary authorities, chiefly in regard to the protection of water supplies, prevented spread. The measures applied in the U.S.A. in 1887 and again in 1892 to infected ships on arrival, on the basis of early laboratory diagnosis, were fully effective in preventing an outbreak. During 1886–88 serious outbreaks, however, occurred in South America, Argentina and Chile being infected. Afghanistan and Persia were again invaded in 1892 with extension to Russia *via* Baku where the disease continued in 1893 and 1894. It was also widespread in Germany and France in 1892. In that year the much quoted epidemic in Hamburg and its suburbs occurred in which the distribution of the disease in relation to the use of unfiltered water was so convincingly demonstrated. In the Far East cholera was prevalent throughout the period.

The sixth pandemic, commencing in 1899, may be said to have lasted to 1923 and was related to marked exacerbations of cholera in India. The disease had not entirely disappeared from western Asia and Egypt at the end of the fifth pandemic but it is considered that local recrudescence played only a minor part. Violent outbreaks in India from 1900 to 1904 were followed by extensions westwards into Afghanistan and the Persian Gulf area (in 1900) and eastwards to Burma, Singapore (in 1901) with later extension to the other countries of the Far East in the following year. Simultaneously the pilgrimage to Mecca was infected by the maritime route, invasion of Egypt following. Russia became infected in 1903 and 1904 probably both by the route through Palestine, Asia Minor, Syria and the Black Sea ports and also by spread through Mesopotamia and Persia to Samerkhand and the Caspian. Infection of Baku was followed by spread to Transcaucasia and thence northwards to the basins of the Volga and Don. There cholera became quiescent in 1906, but in 1908 it was again severely prevalent in Russia over a large area extending up St. Petersburg and on to the Baltic ports. Cholera continued active in Russia right up to 1923, causing heavy mortality. In western Europe in this period the disease failed to obtain a foothold, only a few abortive outbreaks occurring. The American continent escaped entirely. Central and southern Europe, on the other hand, had epidemics of serious proportions but not on the whole at the same high level experienced in previous pandemics. Italy suffered in 1909, 1910 and 1911, cholera being widespread in the last year. Throughout the years from 1910 to 1922 frequent and often severe epidemics occurred in the Balkan countries, local war conditions in 1912–3 and the circumstances of the first World War being factors favouring spread. Central European countries, notably Austro-Hungary, also were affected by the war conditions, and Russian prisoners of war introduced cholera there and into Germany where, however, effective control appeared to be maintained. During 1914–18 Mesopotamia, Persia and Asiatic Turkey were subject to frequent epidemics and Persia remained infected almost perennially from 1911 to 1919 and was again infected in 1922–23. Mecca and the Hedjaz were infected in each of the years from 1908 to 1912 but not subsequently. Cholera outbreaks continued to be frequent and even perennial in many of the countries of the Far East throughout the period. The situation was specially serious in 1908–09 following a period lasting from 1905 to 1908 during which cholera was rampant in India. In those years in India the cholera deaths approximated to or were over 500,000 annually. In 1918 and 1919, when deaths were again over half a million, the countries of the Far East also suffered severely.

In summing up it is remarked that it is impossible to determine with even approximate accuracy the global mortality caused by cholera during the 6 pandemics. It is noted that while the incidence of plague not only in India but throughout the world has diminished rapidly from intrinsic causes, cholera in India shows no signs of a corresponding really satisfactory diminution. Many unsolved problems of cholera still require attention and efficient methods of control capable of easy application must be sought.

[This summary of the account of the 6 pandemics extending over a period of 100 years is necessarily limited and incomplete but will suffice to show the magnitude of the problem created by world spread in the 19th century —an entirely new phenomenon in the history of the disease and in marked contrast with the conditions at the present time, when cholera is once more confined to its original home in the Far East.] *J. Taylor*

Ata, A. El-H. A. **Clinical Study of Sternal Marrow Picture in Cholera.** *J. Egyptian Med. Ass.* 1954, v. 37, No. 1, 19–27.

A study of the bone-marrow in 18 cases of cholera forms the basis of this paper. In 7 of the cases 2 specimens were obtained with an intervening interval of approximately 1 week. The total cell count in the bone-marrows varied from 9,000 to 336,000 per cmm. If the normal range is taken to be 20,000 to 100,000 per cmm., only 6 counts in the series fell outside this range. There were however, fewer myeloblast and myelocyte cells than normal in all cases. Lymphocytes in the bone-marrow were increased in 14 cases and plasma cells were increased in two. There were otherwise no variations from normal in the white cell series. In the red cell series normoblasts were fewer than normal in 17 of the 18 cases.

In 1 patient who, it is stated, died from uraemia, myeloblasts and myelocytes were fewer than normal and neutrophils were increased in number. In another, in whom the disease was complicated by jaundice, there was a slight increase in the number of plasma cells and also an increase in lymphocytes. Similar changes were found in a patient in whom parotitis complicated the disease. An increase in lymphocytes in the peripheral blood did not usually accompany an increase of these cells in the marrow. During convalescence, both the myelogram and the peripheral blood reverted to normal. *A. W. Woodruff.*

Lahiri, S. C. & Basu, S. N. **L-*Nor*adrenalin in the Treatment of Circulatory Collapse in Cholera.** *J. Indian Med. Ass.* 1954, Apr., v. 23, No. 7, 285–8, 3 figs. [10 refs.]

In cholera, it is stated, there occurs an initial fall in blood pressure as the result of loss of circulatory fluids. In severe cases, and particularly in children and old people, this passes into a condition resembling secondary shock for which treatment may be difficult or impossible. Within the last few years *nor*adrenaline has been shown to cause an increase in total peripheral vascular resistance and has been described as the most rational agent for the treatment of hypotension of peripheral origin. It was in view of these considerations that it was decided to assess its value in the " secondary shock " occurring in cholera.

The drug was used in 47 cases and to each between 6 and 13 pints of normal saline had previously been given intravenously. It is stated that " l-*nor*adrenaline was not given until the specific gravity of blood came near

about 1060 ''. In 12 of these 47 cases the pulse and blood pressure improved immediately; a delayed circulatory improvement was observed in 21 cases. The authors emphasize, however, that this delayed improvement may have been due to causes other than the administration of *nor*adrenaline. Death occurred in 19 of the patients, but it is stated that all were severely ill when treated, and had apparently not improved following the administration of saline or other analeptics. Uraemia occurred in 19 patients, of whom 10 died. It is suggested that this considerable incidence of uraemia may have been a result of using *nor*adrenaline by which patients were kept alive longer than would otherwise have been the case.

[This is an interesting and important contribution to knowledge of the therapy of cholera. It would, however, be unfortunate if the use of *nor*adrenaline was allowed to obscure the necessity for the administration of large quantities of normal saline to patients severely ill from cholera.]

A. W. Woodruff

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

See also p. 1197, Kessel, Parrish & Parrish, **Intestinal Protozoa, Helminths and Bacteria in Tahiti, French Oceania.**

Halpern, B. & Dolkart, R. E. **The Effect of Cold Temperatures on the Viability of Cysts of** *Endamoeba histolytica*. *Amer. J. Trop. Med. & Hyg.* 1954, Mar., v. 3, No. 2, 276–82, 2 figs. [26 refs.]

The preservation of foodstuffs in a frozen state, now in common use, has raised the question of the introduction of such diseases as amoebic dysentery with preserved food contaminated in tropical countries. To test this possibility the authors have carried out experiments on the survival of cysts of *Entamoeba histolytica* at low temperatures.

For this purpose, cysts of *E. histolytica* produced in cultures were suspended in Ringer's solution, and treated by 2 methods: (a) 2 ml. amounts of the suspension were placed in test tubes, and (b) 2 ml. of suspension were inoculated into plastic bags containing blanched spinach leaves, and the bags were placed within paraffined cartons. Both the test tubes and bags with the contaminated vegetable were kept in freezing chests at temperatures varying from +4° to −35°C. Observations on the viability of the cysts were made by removing the test-material at intervals from 24 hours to 2 weeks, and cultivating the suspensions or washings of the vegetables—as the case may be—in appropriate culture media, to allow excystation of any surviving cysts.

The results are shown in a number of graphs and tables, from which it is seen that in both sets of experiments cysts exposed to temperatures from +4° to −5°C. remained fully viable during the periods of observation, those kept at −10°C. could be hatched only during the first 48 hours of exposure, whereas exposure for 24 hours at −15°C. and lower is sufficient to kill the cysts, judging from their failure to excyst after that period. *C. A. Hoare*

Seneca, H. & Bergendahl, Ellen. **The Synergistic Amebicidal Effect of Tetracycline, Oxytetracycline and Carbomycin on Cultures of** *Endameba histolytica*. *Amer. J. Med. Sci.* 1954, July, v. 228, No. 1, 16–20.

Tetracycline, one of the newer antibiotics, has an antibacterial spectrum and therapeutic properties similar to those of the better known terramycin (oxytetracycline) and aureomycin (chlortetracycline). Since the amoebicidal properties of oxytetracycline have already been described [this *Bulletin*, 1954, v. 51, 179] the present investigation was undertaken to compare its activity with that of tetracycline against *E. histolytica in vitro*, and to note if there was synergism between them or between either and carbomycin. A diphasic medium consisting of inspissated whole egg with buffered saline overlay was used to culture various strains of *E. histolytica*, some being accompanied by only one bacterium. The drugs were dissolved in buffered saline to give serial dilutions. The following is the authors' summary and conclusion:—

"Oxytetracycline inhibited six strains of *E. histolytica* in a concentration of 31·25 to 250 mcg./cc., while tetracycline inhibited the same strains in 62·5 to 250 mcg./cc.

"There was a fourfold increase in the inhibitory effect on cultures of *E. histolytica* when equal amounts (by weight) of tetracycline and oxytetracycline were combined, and a twofold increase when tetracycline or oxytetracycline were combined with carbomycin." *J. D. Fulton*

Seneca, H. *In vitro* **Acquired Resistance and Sensitivity of** *Endamoeba histolytica* **to Oxytetracycline.** *J. Lab. & Clin. Med.* 1954, May, v. 43, No. 5, 713–16.

"Eleven strains of *E. histolytica* were grown from 28 to 51 subcultures in the presence of 0·05 to 1·0 μg/ml. oxytetracycline hydrochloride. Eight strains showed no change, two strains became more sensitive and one strain became more resistant.

"The sensitive strain upon subculturing in normal medium for 10 subcultures reverted back to normal sensitivity while the resistant strain maintained its resistance even after 20 subcultures in the normal medium in the absence of oxytetracycline hydrochloride."

Buonomini, G. & Braccini, L. Su la diagnosi parassitologica di Amebiasi. Nota II.—Proposta di uno schema di indagini ai fini di una corretta diagnosi di *E. histolytica*. [**The Parasitological Diagnosis of Amoebiasis. Second Note.—A Suggested Plan for Investigations for a Correct Diagnosis of** *E. histolytica*] *Riv. Italiana d'Igiene*. 1954, Jan.–Feb., v. 14, Nos. 1/2, 6–23, 1 fig. [21 refs.] English summary (8 lines).

Amoebiasis is not at all uncommon in temperate climates and the infestation is generally found in the forms of either subacute or chronic illness or of symptomless excretion (coprobiosis). The authors refer to such forms of *Entamoeba* as *E. dispar* and *E. hartmanni* and advise that for both curative and prophylactic purposes we should distinguish a "typical form" of *E. histolytica* from a "smaller race" of the same species. The former produces 4-nucleated cysts of a diameter of 10–20μ, the latter's cysts being less than 10μ (9μ after fixing) in diameter.

In the light of present knowledge the authors think that we should accept the assumptions which Porter (*Annu. Rev. Microbiol.*, 1953, v. 7, 273) has

laid down as follows:— " (*a*) the small cyst-producing type of *E. histolytica* is virtually nonpathogenic in man, (*b*) the large cyst type varies greatly in virulence, (*c*) in carriers the amebae may often live as commensals in the lumen of the intestine, and (*d*), at least with strains of moderate virulence, the initiation of significant lesions in the tissues requires both minimal natural immunity and accessory action by bacterial, dietary, or other factors ".

In the acute and subacute forms it is best to search the fresh stools in diarrhoea or after loosening with a saline; in the latter case the parasite is more likely to be found in the second or subsequent discharges.

From chronic patients or symptomless excreters, the normally discharged stools are best searched repeatedly first, after concentration of the cysts in the specimen: fresh specimens resulting from a saline should be examined next.

In the examination of fresh specimens, these should be kept throughout at 36°C.–38°C., above and below which the trophozoites tend to lose their mobility; Foot's chamber (which is shown in an illustration) is very useful for this: Quensel's method of vital staining brings out the nuclear and other inclusion characteristics in fresh specimens. The authors give various techniques for fixing (Schaudinn with polyvynyl alcohol) and staining and for the culture of amoebae.

The following plan is suggested:—

(1) in suspected chronic cases and symptomless excreters, search for cysts in normally discharged specimens after concentrating by sedimentation or flotation methods;

(2) in the presence of diarrhoea in acute and subacute cases, and after a saline purgative in all cases including suspected carriers,

i. examine fresh specimens at 36°C.–38°C.,
ii. examine same after vital staining,
iii. examine fixed specimens,
iv. culture in appropriate media.

A table of differential diagnosis for 5 common species is given.

J. Cauchi

Sohier, R., Benazet, F., Vignes, M. & Denjean, B. Traitement de l'amibiase intestinale par le sel sodique du *bis*-(*p.* arsonophénylamino)-1,2 éthane. [**Treatment of Intestinal Amoebiasis with the Sodium Salt of *bis*(*p.* arsonophenylamino)-1,2 ethane**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 56–61.

A total of 58 patients with amoebiasis, 33 of them suffering from acute amoebic dysentery, 17 from a subacute form of the condition and 8 without parasites, were treated with 4763 RP [*diaphétarsine, Bémarsal*]. The immediate effect was excellent in all but 2 patients in whom parasites continued to be excreted. Of 20 patients observed for 11 months only one had a parasitic relapse, though 3 others had clinical relapses. [See also this *Bulletin*, 1953, v. 50, 415, 416, 1045; 1954, v. 51, 60 and 488.]

A. R. D. Adams

Schindel, L. **Treatment of Amebiasis with Fumagillin.** *J. Amer. Med. Ass.* 1954, July 3, v. 155, No. 10, 903–5.

Three Palestinian patients suffering from amoebic dysentery were treated orally with fumagillin. The first, a man of 60 years, was given 10 mgm. thrice daily for 3 days, and then 20 mgm. thrice daily for 7 days—a total of 510 mgm. of the drug. The stools, originally containing amoebae and

cysts, were free of parasites after the third day and 5 months later they were still free from them. But a month after the completion of the treatment there was peeling of the palms and soles, and the patient developed a large right hydrocele.

The second, a woman of 39 years with an enlarged liver was given 10 mgm. thrice daily for 3 days and then 20 mgm. thrice daily for 8 days, a total of 570 mgm. She also passed stools free from parasites after the third day and they were still parasite-free 14 weeks later. This patient suffered from nausea and from temporary loss of sensation in the hands and feet and defective hearing about half an hour after each dose of fumagillin. Half-way through the course of treatment she suffered from occipital headaches, nausea and giddiness. On the 12th day there was pain in the right thigh with tenderness and swelling; there was also a folliculitis on the face. At the end of the third week there was desquamation of the palms.

The third patient, a woman of 43 years with a vitamin B deficiency syndrome, was given 10 mgm. thrice daily for 2 days; she then refused to take the drug as she had severe headaches and nausea, fever, and tonsillitis. After 4 days' treatment with a sulphonamide the fumagillin course was resumed, 10 mgm. being given twice daily for another 10 days. There were less severe headaches and some abdominal pains after meals throughout the course; abdominal discomfort and constipation persisted for the next 4 months. Parasites disappeared from the stools by the third day of treatment and have not been seen in them since.

The author considers that fumagillin, though therapeutically very effective in amoebiasis, causes bizarre toxic side-effects. *A. R. D. Adams*

Rendtorff, R. C. **The Experimental Transmission of Human Intestinal Protozoan Parasites. I.** *Endamoeba coli* **Cysts given in Capsules.** *Amer. J. Hyg.* 1954, Mar., v. 59, No. 2, 196–208, 1 fig.

The object of this series of studies—of which this is the first—is to fill some of the gaps in our knowledge of the host-parasite relations between man and his intestinal protozoa, by experiments on human volunteers.

In the present experiments 26 prison inmates, who had previously been found to be free of infection, were given by mouth doses of cysts of *Entamoeba coli* obtained from stools by a concentration method and freed of concomitant bacteria. The micromanipulator was used to isolate up to 1,000 cysts, while larger doses were counted in a haemacytometer. Saline suspensions of the required inocula—which ranged from 1 to 10,000 cysts—were transferred to gelatin capsules, which were swallowed with 4–6 oz. water. After inoculation, the stools of the volunteers were examined for the presence of parasites for 6 months, including a " period of intensive observation " lasting 10 weeks, when the men were kept in isolation under strict control.

Out of 26 men, 8 (30·8 per cent.) became infected, whereas 15 controls remained negative. In one case, infection resulted from a single cyst, and in 3 from 10 cysts. The prepatent (or incubation) period varied from 6 to 22 days, with an average of 10 days. The duration of observation on the infected men was from 68 to 162 days after inoculation, during which periods there was no evidence of spontaneous recovery from the infection. Though the first appearance of parasites was sometimes associated with looser and more frequent stools, or with constipation, there were no clinical symptoms attributable to the infection, thus confirming the non-pathogenic nature of *E. coli*. *C. A. Hoare*

Rendtorff, R. C. **The Experimental Transmission of Human Intestinal Protozoan Parasites. II.** ***Giardia lamblia*** **Cysts given in Capsules.** *Amer. J. Hyg.* 1954, Mar., v. 59, No. 2, 209–20, 1 fig.

In the second paper of this series experiments on human volunteers were carried out with *Giardia intestinalis*, by the same methods as in the preceding study [see above]. Known numbers of cysts (from 1 to 1,000,000) were given *per os*, with small amounts of saline in gelatin capsules and a draught of water, to a total of 40 men. Of these, 21 (52·5 per cent.) became infected, while all the controls (21) remained negative. The inoculation of 1 cyst failed to infect, but 8 out of 22 men became infected with 10 to 25 cysts, while all the 13 men receiving from one hundred to one million cysts contracted an infection. The prepatent period ranged from 6 to 15 days (average 9·1). In contrast to *Entamoeba coli*, the infections with *Giardia* disappeared spontaneously in 5 to 41 days, but in 2 cases they persisted for 129 and 132 days, respectively. Though in some persons the stools became looser and more frequent when the parasites made their first appearance, " in no instance did any clinical illness or subjective complaint occur among the subjects which could be attributed with certainty to *Giardia* infections ". *C. A. Hoare*

Flick, Eleanor W. **Experimental Analysis of some Factors influencing Variation in the Flagellar Number of** ***Trichomonas hominis*** **from Man and other Primates and their Relationship to Nomenclature.** *Exper. Parasit.* New York. 1954, Mar., v. 3, No. 2, 105–21. [35 refs.]

Some authors have classified the Trichomonad flagellates according to the number of free anterior flagella, in the following 3 genera: *Trichomonas* with 4 flagella, *Tritrichomonas* with 3, and *Pentatrichomonas* with 5. According to this classification the human intestinal flagellate should be known as *P. hominis*. However, since the flagellar number in this species is subject to some variation, the author has investigated this problem by analysing the factors influencing variation in the number of anterior flagella in the *hominis*-like Trichomonads of man and other primates. The flagellates examined belonged to 13 strains from man and 32 from various monkeys. These strains and clones, produced by inoculation of a single flagellate, were grown in different culture media, with a mixed bacterial flora or with a single microorganism (*Bacterium coli*), and preparations were fixed and stained by various methods. In this study the effect of the following factors upon flagellar variation was analysed statistically: different staining methods, different culture media, different strains, and age of culture. It was found that the age of the culture had the greatest influence upon the number of flagella, the tendency being to lose the " independent " flagellum in older cultures, leaving only the group of four in the " 4 + 1 " arrangement characteristic of the Trichomonad in question. However, the medium *per se* produced only insignificant variation, but it was marked when different staining methods were used, while there was no difference between various strains in which the typical number of flagella (5) was predominant.

Since the genus *Pentatrichomonas* was based on a highly variable character, this cannot serve as a basis for classification. It is therefore recommended that the name *Trichomonas hominis* should be retained for the human intestinal flagellate. *C. A. Hoare*

Ruiz, A. & Trejos, A. Primeros casos costarricenses de isosporosis. [**First Records of *Isospora* Infection in Costa Rica**] *Rev. Biologia Trop.* San José, Costa Rica. 1953, Dec., v. 1, No. 2, 117–34, 20 figs. English summary.

The authors record the finding of *Isospora* infection in 5 out of 44 children who were inmates of a home (*dormitorio*) [presumably in San José], Costa Rica. For comparison, a faecal survey was made among 100 children in the paediatric wards of the local hospital, but no cases of coccidiosis were detected, though later 2 patients were found to be infected. The total number of cases of human coccidiosis reported up to date (1953) was thus 7. From a comparison of the incidence of infection and the sanitary conditions in the children's home and in the hospital, the authors believe that the low state of hygiene in the former contributed to the high infection rate of coccidiosis.

Since the children harboured various other intestinal protozoa, as well as helminths, which are tabulated, none of the intestinal disorders observed could be attributed to coccidiosis.

A description is given of the coccidial oöcysts in various stages of development, illustrated by photomicrographs. The authors are undecided as to whether they belong to one or two species of *Isospora* [but from the description and figures it is evident that they were dealing with *I. belli*, and not *I. hominis*]. *C. A. Hoare*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Hoogstraal, H. **A Preliminary, Annotated List of Ticks (Ixodoidea) of the Anglo-Egyptian Sudan.** *J. Parasitology.* 1954, June, v. 40, No. 3, 304–10, 1 fig.

The data given are extracted from a monograph, now being prepared, on African tick-borne diseases, with special reference to the Anglo-Egyptian Sudan. Many of the records represent a considerable extension of known ranges. Twenty-two species were listed by King in 1926; the present list includes 60 species belonging to 10 genera. The name of the province in which each species has been collected is given, and where no previous record exists the fact is recorded. *Anne Hudson*

Falcone, G. Le complicazioni oculari nella febbre ricorrente da zecca in Somalia. [**Eye Complications of Tick-borne Relapsing Fever in Somaliland**] Estratto dagli Atti I. Congr. Interregion. Estafricano, Asmara, 30 mar.–5 apr. 1952. *Boll. Soc. Ital. di Med. e Igiene Trop. in Eritrea.* Special Number. pp. 319–33, 1 fig. [28 refs.] English summary.

Out of a total of 10,596 new patients seen in the Ophthalmic Department of the Civil Hospital at Mogadishu during 1949–51, 604 (5·70 per cent.) were suffering from optic neuritis and uveitis; 111 of these cases were associated with relapsing fever and at least 91 others were probably so associated. A graph referring to this 3-year period shows that the incidence curve for these two eye conditions due to relapsing fever rises in correspondence with the curve of the epidemic which occurred in 1951. *All* cases of optic

neuritis and uveitis show a nearly corresponding though slightly delayed peak of incidence and this suggests that they may have been often responsible even when a history of relapsing fever was not ascertainable. The eye complications are late events of a relapsing fever attack, usually follow a number of relapses, and are believed by Falcone and others to be the result of involvement of the central nervous system and due to direct action of the infective agent or of a toxin which it produces. These cases present other symptoms and signs of involvement of the central nervous system such as persistent headache, cervical rigidity, presence of the organism or other changes in the cerebrospinal fluid. The eye complication sometimes only occurs after the patient has been considered cured: in such cases the infection must have remained latent and the eye changes are often accompanied by a relapse.

The most frequent complication seems to take the form of an iridocyclitis, but Falcone believes that if routine ophthalmoscopic examination is undertaken in all cases of relapsing fever eye complications will be found invariably to begin with slight changes at the optic disc. Such specific remedies as the arseno-benzols fail to control uveitis and optic neuritis due to relapsing fever, but the author reports encouraging results from the local use of a 1 per cent. cortisone cream. He has not yet been able to obtain adequate supplies of cortisone to test the effect of this drug by injection.

In the Mogadishu Hospital in 1950–51, there were 577 patients undergoing treatment for relapsing fever and 65 of these (11·3 per cent.) developed an optic neuritis or an uveitis.

All relapsing fever in Somaliland is tick-borne and is spread by either *Ornithodorus moubata*, which lives in the cracked floors of native houses, or by *O. savignyi*, which is to be found in sandy or other soil in the open. Both these ticks feed on human and animal blood, but they do not stay attached to their host after feeding. *J. Cauchi*

Juarez, E. & Fernandez, E. Contribución al tratamiento de la fiebre recurrente española por la aureomicina. [**Aureomycin in the Treatment of Relapsing Fever in Spain**] *Rev. Sanidad e Hig. Pública.* Madrid. 1954, Mar.–Apr., v. 28, Nos. 3/4, 133–59.

Fifty-four relapsing fever patients received treatment with aureomycin; 8 of them had previously been given penicillin and 2 of these 8 had had neosalvarsan on alternate days for 10 days to a total of 2·4 gm. The fever returned, with intense headache, and treatment was changed to "aquicilina" [? a synonym of penicillin], 300,000 units on 3 successive days. The fever was reduced but the headache persisted, with bradycardia, vomiting, insomnia and nuchal rigidity. These meningeal symptoms continuing for 10–12 days, aureomycin was substituted and cut short the fever, though the headache and general weakness persisted for another 2–3 days. Another patient, a man 32 years of age, was given in an apyrexial period 600,000 units of penicillin daily for 4 days; he left hospital, but a fortnight later the fever recurred, parasites were found and he came to hospital again and was given aureomycin; the fever dropped in 6 hours.

Forty-six were given aureomycin from the start; 3 received 1 gm., 4 had 1·5 gm., the rest had 2 gm. in 0·5 gm. dose every 6 hours. Bradycardia and some degree of headache persisted for a few days, but nothing serious, provided the antibiotic was given in an apyretic interval; but if given while there was fever, there occurred within 1½–2 hours a violent shivering fit,

increase of temperature to 40° or 41°C. and profuse sweating. These untoward symptoms disappeared by the following day. They are ascribed to massive destruction of spirochaetes in the blood and the toxic action of their products.

In their summary the authors state that the vector is *Ornithodorus erraticus*, that, clinically, the cases were largely of a meningeal type with intense headache, vomiting, rigidity of neck and bradycardia, which last persisted in most patients for 3–4 days after the treatment. Relapses occurred only among those who had not received the full dose of 2 gm. In an appendix are given clinical notes of each of the 54 patients treated.

H. Harold Scott

Gil Collado, J. Posibilidades actuales en la lucha contra los " Ornithodoros ". [**Present Possibilities in the Control of** *Ornithodorus*] *Rev. Sanidad e Hig. Pública.* Madrid. 1953, Sept.–Oct., v. 27, Nos. 9/10, 537–49.

The wild habitat of *Ornithodorus erraticus* includes the burrows and shelters of various rodents, reptiles and even amphibians. In Spain it is rather common in pigsties which provide it with a very favourable environment. Human beings can be bitten and there are cases of relapsing fever. Apart from people actually tending the pigs, others may be attacked. Thus some tick-infested pig dung scattered in a field resulted in people suffering from bites when the crop was harvested. Although the ticks may be disseminated in this way, by far the most important breeding site is the pigsty itself; and this is where the tick should be attacked. The ticks are less common in wet sties, for they are hindered by soft mud; also they may be kept down somewhat by keeping chickens together with the pigs. But by far the best method of attack is by insecticides. *Gamma* BHC is more effective than DDT. The infested sties should be sprayed with BHC emulsion or dispersion so as to leave a deposit of 0·34 gm. *gamma* BHC per sq. metre. Alternatively, the soil of the sty can be mixed with 1 per cent. BHC. A similar treatment should be given to the ground at the base of fences or walls used to enclose pigs. Manure from infested sties should not be removed to the fields without spraying it with BHC to destroy ticks.

Treatments of the type described should be done three times a year. It is considered that, owing to the comparatively slow reproduction of *Ornithodorus*, this should result in its eradication from infested districts.

J. R. Busvine

YAWS AND OTHER TREPONEMATOSES

Rein, C. R. **Bacteriologic and Serologic Aspects of Pinta.** *Amer. J. Syph.* 1954, July, v. 38, No. 4, 336–40. [24 refs.]

There is little new in this article, which consists mainly of a review of the literature.

Treponema carateum is morphologically indistinguishable from the treponemas of syphilis, yaws and bejel.

Pinta differs from venereal syphilis chiefly in its slower reaction to treatment, though surface spirochaetes disappear 6–10 hours after the administration of penicillin, and by the fact that it does not cause prenatal,

cardiovascular or neurological lesions; also it does not confer immunity to syphilis and *vice versa*.

Classical serum tests, Kahn verification tests, Neurath's euglobulin inhibition procedure and treponemal immobilization tests, all fail to distinguish pinta from other treponematoses; zone phenomena are common in serum tests for pinta and positive reactions are reversed more slowly than in syphilis.

There is much common to syphilis, yaws, bejel and pinta and all are included in the term treponematosis. *T. E. Osmond*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Zaccaria, R. Epidemiologia e profilassi della lebbra in Tripolitania. [**Leprosy Epidemiology and Prevention in Tripolitania**] *Boll. Sanitario d. Tripolitania.* 1953, Jan.–June, v. 11, 15–24, 1 fig. English summary (6 lines).

A list is given of the cases of leprosy found in Tripolitania each year from 1923 to 1953 involving 175 Libyans, 6 Italians, 8 Jews and 1 Eritrean. A survey carried out in 1937, when compulsory isolation was introduced, produced a total of 35 cases; certain portions of the old hospital were then selected to provide separate accommodation for the two sexes. The number of new cases diagnosed each year has increased and the hospital accommodation provided has become quite inadequate.

Since 1947 78 patients have been admitted. Eighteen of these have been discharged, as required by the law, after 6 successive negative results of examinations made at intervals. The law requires these patients to be kept under observation after discharge but they are usually lost trace of. Sixteen others have escaped and most of these, too, have been lost sight of. Thirteen have died.

The author gives his views about mode of spread and does not exclude the possibility of indirect transmission through insects and rat bite. He stresses the importance of a low standard of living and lack of sanitary conditions in favouring infection and points to the virtual disappearance of leprosy in most western countries under the impact of the " sanitary idea " and its implementation.

He pleads for extensive improvements in the " sanatorium " (which term he proposes in place of the term " leprosarium ") which is provided for the accommodation of lepers in Tripoli. The premises should include separate provision for cases of tuberculosis and for surgery, clean and septic dressing-rooms, laboratory, lounges, library, workshops, laundry, crèche and class-rooms if there are children, and sufficient land for cultivation. A generous subsidy to dependants would reduce the tendency to conceal cases.

Reference is made to the results of using such recent drugs as the sulphones and isoniazid.

[One can see in the author of this paper yet one more of those medical workers whose unselfish devotion has done so much to ease the lot of the

leprosy patient. Many, however, doubt the justification of compulsory segregation; as a measure for controlling this disease, segregation is apt to defeat its own object.] *J. Cauchi*

Touzin, R. & Merland, R. Traitement de la lèpre par une nouvelle sulfone disubstituée. Son élimination dans les milieux biologiques. [**Treatment of Leprosy with a New Disubstituted Sulphone. Its Elimination in the Body Fluids**] *Méd. Trop.* Marseilles. 1953, Nov.–Dec., v. 13, No. 6, 1002–24, 8 charts. [15 refs.]

This disubstituted derivative of DDS is diethyl-4 4′diaminodiphenyl sulphone-disulphonate of soda (M2196), produced by Rose in 1942 but never before used therapeutically. The blood concentration rises rapidly after injection, and then falls to a low level which is maintained almost equal from the 24th to the 48th hour. The concentration produced, after different degrees of dosage, in the blood, urine and milk are shown by means of many graphs and tables. Trials were made on 49 patients, 43 of whom continued the treatment. Of these, 22 were lepromatous, most of them very advanced in the disease. The results were very striking in 11 of the lepromatous cases, as regards both clinical and bacteriological improvement. The product is very soluble and its intramuscular injection causes little or no pain. Injections were given thrice weekly in doses up to 800 mgm., corresponding to 400 mgm. of DDS. It is considered that M2196 is tolerated better than DDS and its other derivatives, and that a constant level of blood concentration is not necessary for efficient results. After only 12 to 18 months' treatment it is still too soon to assess the full results, but it is considered that so far these are promising. *Ernest Muir*

Jouen, J. Physiothérapie de la lèpre au Sanatorium de Ducos. [**Physiotherapy of Leprosy at the Ducos Sanatorium**] *Méd. Trop.* Marseilles. 1954, Jan.–Feb., v. 14, No. 1, 72–7.

Mudrow-Reichenow, Lilly. Die Wirkung von Neoteben (Isonicotinsäurehydrazid) auf den Erreger der Rattenlepra. [**The Action of Neoteben (Isoniazid) on the Organism of Rat Leprosy**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Apr., v. 5, No. 2, 218–27, 1 fig. [24 refs.]

Golden hamsters inoculated intranasally with *Myco. leprae murium* were treated with isoniazid (Neoteben, Bayer), and the effects judged by counts of bacilli in films of the homogenized lungs. Little significant effect was obtained. In intranasally inoculated rats the results were similarly unconvincing. On the other hand, a pronounced therapeutic effect was obtained by each of 3 different daily doses in rats inoculated subcutaneously, the effect being judged by the size of the local lesion and the occurrence or otherwise of extension of the infection to the liver and spleen. [Part of the object of this work seems to have been to show that this brand of isoniazid is as effective as others used by previous workers. See also this *Bulletin*, 1954, v. 51, 944, for previous references.] *L. P. Garrod*

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—Trematodes (*schistosomes, other flukes*); Cestodes (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); Nematodes (*Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

Aparicio Garrido, J. & Prieto Lorenzo, A. Una nueva terapéutica de las helmintiasis intestinales por nematodes.—Experiencias " in vitro " con el fermento proteolitico " papaína ". [*In vitro* **Experiments with the Proteolytic Ferment Papain on Intestinal Nematodes**] *Med. Colonial.* Madrid. 1954, July 1, v. 24, No. 1, 5–13, 7 figs. [12 refs.]

Papain is identical with ficin, the former being a constituent of the juice (sap) of *Carica papaya*, the latter of the latex of *Ficus laurifolia*, *F. glabrata* and *F. carica*. A series of photomicrographs shows the action of papain *in vitro* on *Ancylostoma duodenale*, and *Enterobius vermicularis*. Papain is proteolytic and after 30 minutes its erosive action on the worm cuticle is obvious; a few minutes later the viscera become herniated and after an hour the worm is practically destroyed. The effect on *E. vermicularis* and *Ascaris lumbricoides* is the same, except that the larger specimens take longer for destruction, *Ascaris* needing 2 hours or so.

The papain preparation used was that known commercially as *Vermizym*. It is pulverized in a mortar and made up in a solution of a strength of 4 per cent. in water. The worms are placed in this in a petri dish in the thermostat at 37°C. and specimens are taken out at intervals and examined. [Whether the papain would be equally effective in infection by the worms remains to be tried.] *H. Harold Scott*

Mackie, A. & Cutler, A. A. **Preparation of Phenothiazine Derivatives as Possible Anthelmintics.** *J. Chem. Soc.* 1954, July, 2577–9.

Schwetz, J. Sur la classification et la nomenclature des planorbes africains. (A propos de l'article de G. Ranson : " Observations sur les Planorbidae africains ".) [**Classification and Nomenclature of African Planorbids**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 270–76, 6 figs. on pl. Réponse de G. Ranson 276–8.

The author criticizes adversely the idea that it may be possible to resolve the confusion existing in the nomenclature of African molluscan vectors of schistosomes by the examination of the internal anatomy of the snails, namely, by the malacological method. He criticizes in particular the article by Ranson [see in title above and this *Bulletin*, 1954, v. 51, 948], which contained descriptions and drawings of the anatomy of 6 African species of *Planorbis*. He concludes his discussion as follows [free translation from the author's summary in French] : " The malacological method having given no results, we can only return to the conchological method, but bearing in mind that conchology is merely a consequence of ecology ".

In his reply to the article by Schwetz, Ranson refers to two errors in his (Ranson's) article and rectifies these. He goes on to defend the " malacological method " and makes counter-criticisms of certain points in Schwetz's article. Concerning the opinion that the malacological method

has given no results, he remarks: "This statement is unfounded, since the malacological approach to the problem has only just begun" [free translation]. *J. J. C. Buckley*

Schwetz, J. **On some Planorbidae Shedding** *Schistosoma* **Cercariae, found in the Town of Ndola, Northern Rhodesia.** *J. Trop. Med. & Hyg.* 1954, July, v. 57, No. 7, 153–5, 1 map.

The author reports on a snail survey made by him at Ndola where he searched for snails at 7 different points in the vicinity of this town. *Planorbis pfeifferi* was found in Twapia dam but was very scarce elsewhere. *Physopsis africana* was the commonest of all the species of snails found in Ndola but did not occur in Twapia dam. Schistosome cercariae were emitted by both these species but attempts to infect mice gave inconclusive results. *J. J. C. Buckley*

Schwetz, J. Observations sur le comportement comparatif du complexe planorbes *S. mansoni* et celui de *Physopsis S. haematobium* dans les foyers séparés ou mixtes de *S. mansoni* et *S. haematobium*. [**Observations on the Comparative Behaviour of Planorbids with** *S. mansoni* **and** *Physopsis* **with** *S. haematobium* **in Separate or Mixed Foci**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 332–8.

It is generally accepted that it is more difficult to infect *S. haematobium* snail vectors with this species than it is to infect *S. mansoni* vectors with *S. mansoni*. Similarly it is more difficult to infect laboratory animals with *S. haematobium* than it is with *S. mansoni*. Moreover, in foci of *S. haematobium* infections the numbers of naturally infected *Physopsis* are comparatively small and cercarial emission from snails is scanty. The author comments on these points and gives examples from his own experiences in the field and in the laboratory. He also noted that cercariae from 2 *Physopsis* gave unisexual male infections in mice, and that cercariae from more than 2 *Physopsis* resulted in bisexual infections in mice but that development was very slow compared with that of *S. mansoni* cercariae from *Planorbis*. *J. J. C. Buckley*

Deschiens, R., with the technical collaboration of H. Lamy. Influence de la concentration en gaz carbonique des eaux naturelles sur les mollusques vecteurs des bilharzioses. [**Influence of Carbon Dioxide Concentration of Natural Waters on Snail Hosts of Schistosomes**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 264–70.

The author's summary in French is translated freely as follows:—

Having reviewed the rôle of thermal, hydrological, actinic and orographical factors on populations of Planorbinae and Bulininae, vectors of schistosomiasis, the authors consider the effect on these molluscs of gases dissolved in water (CO_2, H_2S, CH_4), of mineralization of the water (by sulphates, sulphides, silicates, carbonates and arsenates) and its content of organic material (ammoniates, nitrates and nitrites).

Carbon dioxide has a lethal effect on *P. glabratus* and on *B. contortus*, from concentrations of about 1·40 gm. per litre.

The resistance to asphyxiation of *P. glabratus* and *B. contortus* is considerably greater than that of the red fish, *Carassius auratus*.

The concentration of dissolved gases, mineral salts and organic material in natural waters may be accepted as having a regional or local influence on the distribution of snail vectors of schistosomiasis. *J. J. C. Buckley*

Deschiens, R., Lamy, L. & Lamy, Huguette. Sur un ostracode prédateur de bullins et de planorbes. [**An Ostracod Predator of** *Bulinus* **and** *Planorbis*] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 956–8, 2 figs. on pl.

The authors observed that the destruction of snails (*Bulinus* and *Planorbis*) in the laboratory coincided with the appearance in the water of a small ostracod crustacean, identified as *Cypridopsis hartwigi* Muller, 1900, and when these animals were eliminated from the water, the snail colonies recovered. The ostracods are described briefly and illustrated. In sufficient numbers (10 ostracods to one snail), they were seen to attack the snails immediately and these died in about 24 hours. *C. hartwigi* is recorded here in France for the first time. It is known in Sweden, Poland, Russia, Germany, Corfu and North Africa. Its possible use as a method of biological control against schistosomiasis is suggested. *J. J. C. Buckley*

Messent, J. J. **Triostam in Schistosomiasis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, July, v. 48, No. 4, 351–2.

The author describes the treatment of 40 Africans in Accra suffering from proved *S. haematobium* infections. They were given Triostam (trivalent sodium antimonyl gluconate) in a total dosage of 20 mgm./kgm., given intravenously in 6 per cent. aqueous solution divided into 6 daily injections.

The centrifuged urine was examined on the last day of treatment, then weekly for 3 weeks and finally at 10 to 20 weeks.

About half the patients felt feverish after the injection and in one case this necessitated cessation of treatment. Four patients complained of nausea and 3 of vomiting.

The results are given in a table, which shows that in only one case were ova found in the urine after 3 weeks. Of 34 who were examined later, 19 were negative. Of the 15 positive cases, it is suggested that some had been re-infected.

The injections were popular and adolescents seemed to tolerate the course well. The author thinks that Triostam may prove to be the preparation of choice in the treatment of Europeans with urinary schistosomiasis.

H. J. O'D. Burke-Gaffney

Deschiens, R., Lamy, L. & Reynaud, R. Sur l'action anthelminthique de désoxybenzoïnes basiques dans la bilharziose à *Schistosoma haematobium*. [**Anthelmintic Action of Basic Deoxybenzoins in** *Schistosoma haematobium* **Infections**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 71–7.

The authors have further been studying the anthelmintic properties of chemical compounds prepared by Libermann (*Bull. Soc. Chimie Biol.*, 1952, v. 34, 1026), and referred to as "*desoxybenzoines*". One of these —1183 TH—has already been the subject of a report by the authors [this *Bulletin*, 1954, v. 51, 1073]; it consists of a mixture of two isomers, one of which appears to be powerfully anthelmintic and the other inactive. Four

others now reported on have proved either to be inactive or weakly anthelmintic, with one exception. The graphic formulae of these compounds are given.

Patients with clinically active *Schistosoma haematobium* infections, and others with urinary and intestinal schistosomiasis in French Equatorial Africa, were used for therapeutic trial of some of these compounds. It seems that 1183 TH is the most effective of them, and that it shows value as a curative drug in the cases of *S. haematobium* infection. A further, more extensive, and detailed field trial of this drug is therefore desirable.

A. R. D. Adams

Lyons, R. T. & Benson, J. *Schistosoma mansoni*: **a Study of 26 Puerto Ricans in a Non-Endemic Area.** *Ann. Intern. Med.* 1954, June, v. 40, No. 6, 1194–206, 3 figs. [13 refs.]

Puerto Ricans serving in the U.S. Army in Europe all passed the usual physical examination before enlistment. But 26 of those in hospital in Europe for a variety of complaints were found to harbour *Schistosoma mansoni* infections; only one of these was admitted with a diagnosis of schistosomiasis. The incidence of schistosomiasis in Puerto Ricans must therefore be high. The most consistently effective single method of diagnosis was rectal biopsy. Treatment with tartar emetic was effective, but it produced many toxic side-effects. *A. R. D. Adams*

Lagrange, E. Le sexe des cercaires de *Schistosoma mansoni*. [**The Sex of *S. mansoni* Cercariae**] *Riv. di Parassit.* Rome. 1954, Apr., v. 15, No. 2, 81–4. [11 refs.]

The English summary appended to the paper is as follows:—

"The writer followed during many years a strain of *S. mansoni* which was unable to produce normal infections with the two sexes of worms, using as infective material the cercariae of a single planorbis.

"Another strain gave him a bisexual infection with the cercariae of a single snail."

Moore, D. V., Yolles, T. K. & Meleney, H. E. **The Relationship of Male Worms to the Sexual Development of Female** *Schistosoma mansoni*. *J. Parasitology.* 1954, Apr., v. 40, No. 2, 166–85, 6 figs. on 2 pls. [26 refs.]

Earlier investigators have shown that, in the absence of male worms, female *Schistosoma japonicum* and *S. mansoni* do not attain full body size nor do they reach sexual maturity.

The authors carried out 6 experiments on the sex relationship of *S. mansoni* discharged from *Australorbis glabratus*.

First, 3 series of controlled observations were made on the rate of sexual development of female worms in mice under various conditions of exposure. In the first experiment mice, which were already harbouring an immature unisexual female infection of 11 weeks' duration, were exposed to male-producing cercariae. In the second experiment, female cercariae were added to an existing unisexual male infection to determine if they were capable of development and, if so, to study their rate of development. In the third experiment, the normal sexual development of female *S. mansoni* was followed in mice which had been exposed to a simultaneous bisexual infection so that the male and female worms were of the same age. The

various phases of maturation of the female worms are recorded in full. The rate of growth and sexual maturation of the female worms was not significantly altered in either the first or second experiment as compared with the third; a period of up to 7 weeks after males were added to females, and conversely, was necessary for the sexual maturation of all the females. In the first and third experiments the females did not show evidence of maturation until the seminal vesicles of the males contained spermatozoa, and in the second experiment, where females were introduced upon an existing mature male infection, maturation of the female coincided with the appearance of spermatozoa in her fertilization chamber. It is considered possible that a hormonal substance may be transferred with the spermatozoa.

The remaining experiments comprised studies on possible hormonal influences. A particulate suspension of mature male worms was injected intraperitoneally into mice harbouring immature female worms, but no sexual development of the worms occurred. The next experiment was made to determine the effect of testosterone propionate, administered intraperitoneally, on the development of immature female worms in unisexual infections. The results showed that the drug did not stimulate the females to complete their sexual development. Some, however, showed ovarian anomalies such as the formation of an extra mass of ovarian tissue, and others showed abnormal eggs in the uterus. The sex of the host animals had no influence on the development of the worms. In the last experiment of the series, living mature male *S. mansoni* were implanted in the peritoneal cavities of mice harbouring unisexual female infections of up to 34 weeks' duration. No evidence of sexual development was obtained, and most of the implanted males were dead after two weeks. Controls showed that female worms in unisexual infections, 315 days old, were capable of completing their development when fertilized by male worms from a normal superimposed exposure.

This series of experiments shows that living mature male worms are essential for the sexual maturation of female *S. mansoni*. It is concluded that the principal, if not the only, stimulus to sexual maturation of female *S. mansoni* is provided by the products of the male worms in the act of copulation. *R. B. Griffiths*

Newton, W. L. **Albinism in** *Australorbis glabratus*. *Proc. Helminthological Soc. of Washington*. 1954, July, v. 21, No. 2, 72–4.

"Crosses between albino snails of a Brazilian strain and pigmented snails of a Puerto Rican strain of *Australorbis glabratus*, and the subsequent self-fertilization of F_1 and F_2 progeny, gave results which indicated that albinism is inherited as a simple Mendelian recessive in this snail. The existence of other genetic factors controlling the amount and pattern of pigmentation appears likely. The use of the albino variety of the snail in certain studies on relationships between *A. glabratus* and *Schistosoma mansoni* is discussed."

Vercammen-Grandjean, P. H. Dépistage et contrôle de la bilharziose. [**Diagnosis and Control of Schistosomiasis**] *Ann. Soc. Belge de Méd. Trop.* 1954, Jan. 28, v. 34, No. 1, 135–7.

A method of preparing an emulsion of stools and examining it for *Schistosoma mansoni* eggs with a dissecting microscope. In the author's hands it has proved considerably superior to other methods of search for the eggs. *A. R. D. Adams*

Newsome, J. **Clinical Test of the Miracil Compound 27T51.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, July, v. 48, No. 4, 342–3.

"The lucanthone ('miracil') compound 27T51, which was found to be active against *Schistosoma mansoni* in baboons, proved to be unsuitable for human treatment. A single dose caused severe nerve deafness and repeated doses were considered impracticable. Single doses at the rate of 12·5 mg./kg. had no effect on *Schistosoma haematobium* infections in man."

Mauzé, J. & Arnaud, G. L'oxyde stanneux dans le traitement de la bilharziose intestinale. [**Stannous Oxide in the Treatment of Intestinal Schistosomiasis**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 77–9.

Stannous oxide given orally, it has been claimed, is therapeutically effective in schistosomiasis. The authors obtained tablets of stannous oxide for trial in 38 cases of intestinal schistosomiasis in Guadeloupe. The dosage for children and for adults appears to have been 3 or 4 gm., in divided doses, daily for 8 days; this was repeated on several occasions, with intervals of 8 days between treatments, if eggs were still to be found in the stools. The side-effects were slight, and took the forms of vomiting and headache in susceptible persons. The results are said to have been excellent. Some details of 5 cases are given; one of the patients is said to have remained free from symptoms and stool-negative 22 months after treatment.

In the discussion following this paper Deschiens, Lamy and Montel commented on oral therapy with tin salts, especially in the treatment of schistosomiasis. It was stated that tin had not proved very effective in lesser dosage (1 gm. daily) in some Africans with *Schistosoma haematobium* infections at Brazzaville; when 3 gm. daily was later given to another patient it produced a cure. Tin treatment also was said to be good in the treatment of intestinal cestode infections in Indo-China.

A. R. D. Adams

Thompson, J. H., Jr. **Host-Parasite Relationships of** *Schistosoma mansoni*. *Exper. Parasit.* New York. 1954, Mar., v. 3, No. 2, 140–60, 4 figs. [37 refs.]

Although most of this paper is concerned with the development of resistance to re-infection with *Schistosoma mansoni* in various rodents, a detailed account of the establishment of *S. mansoni* in the laboratory is given. Evidence is produced that *Australorbis glabratus* of Venezuelan origin does not develop resistance to infection; all members of any group of snails will eventually become infected after repeated exposure to miracidia.

Experiments with rodents revealed that mice infected with female worms alone were not protected against subsequent exposure 10 weeks later to cercariae of both sexes; the number of worms developing from the second exposure was not reduced appreciably below the expected yield.

An attempt was made to immunize mice with a vaccine prepared from freshly killed formalinized whole cercariae. Following subsequent exposure to percutaneous infection there was no significant difference between the numbers of worms developing in vaccinated and non-vaccinated mice.

In order to study the effect of a maturing infection on re-infection, mice were subjected to multiple exposures at intervals shorter than those necessary for complete development of the worms resulting from at least

the previous exposure. After more than 3 such exposures, at intervals ranging from 1 to 4 weeks, the percentage of the total number of cercariae eventually recovered as worms was materially less than that noted after a single or a double exposure. Moreover, though the animals died in such time—relationship to some one exposure that, provided no resistance mechanism had operated, immature worms would have been expected, there was an absence of immature worms. This suggested some early destruction of recently acquired larvae from the later exposures to infection, some degree of immunity being acquired from challenging doses of cercariae.

In the next series of experiments, mice, hamsters, guineapigs and white rats were exposed to a bisexual infection which was allowed to develop to patency. After 12 weeks these animals were re-exposed and sacrificed some 3–5 weeks later. The number of mature worms recovered at autopsy was used an an index of the number of cercariae which became established as a result of initial infection, and the number of immature worms was adopted as a measure of the effect of the second exposure. In mice and hamsters, the average percentage of worms which developed from the second exposure was almost the same as that after the first. There appeared to be no destruction of worms or eggs in the tissues, and viable eggs were excreted throughout the period of observation. No resistance had developed as a result of the initial infection. In spite of the well-known difficulties in establishing infection in guineapigs and rats, similar results as regards worm recovery were observed in these more resistant hosts. The author states: "If the resistance of guinea pigs and albino rats to infection by human schistosomes was to any great degree related to the ease of acquisition of immunity, one would expect that reinfection would be inhibited significantly by a previous infection". This was not the case. Splenectomy in mice and rats did not affect the course of initial or re-infections.

The course of infection and re-infection in guineapigs and rats is discussed further. In the former, eggs were not demonstrated in the faeces but they were found in the liver and intestinal wall, either as degenerate or as partially destroyed forms. There was no actual evidence of active destruction of worms although this probably took place. In the highly resistant rat, eggs were not found in the faeces, but masses of destroyed eggs together with actual destruction of worms were evident in the liver. Natural rather than acquired resistance is believed to account for these changes.

Finally, a study was made of the effect of mature worms in guineapigs and rats on subsequent multiple exposures. The animals were exposed initially to large doses of cercariae and later similarly re-exposed up to a total of 4 exposures at intervals of 12 weeks. Representative animals were sacrificed 12 weeks after the first exposure, and at 4-week and 12-week intervals from the second to the fourth. Immature worms, in a percentage comparable to the expected return, were recovered 4 weeks after each re-exposure. At each 12-week autopsy immature worms were absent. Active destruction of worms and eggs was again noted in both guineapigs and rats, but this is a natural process and not a reflection of acquired immunity. There was no indication of immunity preventing establishment of infection. It appears that guineapigs and rats do not acquire a greater degree of immunity by exposure than they possess naturally.

The author concludes: "From these observations and those of others, it may be predicated that, as indicated by the experiments on mice, some immunity to *Schistosoma mansoni* may develop in man and perhaps some of his domestic animals if re-exposures are light and frequent; however, human beings probably may be more like the guinea pig and the albino rat

in their reactions to this infection. Thus, constant destruction of parasites and eggs takes place in infected human beings because of *natural* resistance. This, more than *acquired* immunity, probably accounts for man's survival in regions where schistosomiasis is endemic ". *R. B. Griffiths*

Daugherty, J., Garson, S. & Heyneman, D. **The Effect of *Schistosoma mansoni* Infections on Liver Function in Mice. I. Amino Acid Oxidase and Ammonia.** *Amer. J. Trop. Med. & Hyg.* 1954, May, v. 3, No. 3, 511–17.

The paper records an investigation on the effects of *S. mansoni* on the functions of the liver associated with protein metabolism in mice. Mature male albino mice were infected with 125 cercariae by exposure of the tail. Observations were made on the infected animals on the sixth and seventh weeks thereafter. To obtain uniformity of results in regard to non-protein amino nitrogen determinations, mice were deprived of food on the day prior to experiment. On the following day half the control and half the infected mice were given saline by stomach tube. The remainder in each group were given casein digest. Sixty minutes later the mice were killed and weighed and their livers on removal were weighed. Free amino nitrogen was determined in that organ and in muscle after a homogenate had been prepared and the protein removed. Respiratory studies were made on minced liver tissue, and the amount of ammonia present in the filtrate was determined. The data given in tables, including the relation of liver to body weight in control and infected mice and the percentage dry weight of that organ in these 2 groups, showed that there was an increase in size and water content during infection. There was a decreased activity in amino acid oxidase systems in the infected livers, and a failure in ammonia metabolism. Nevertheless little light was thrown on the immediate cause of death in schistosomiasis. *J. D. Fulton*

Komiya, Y. & Ishii, K. **The Shedding Aspect of Cercariae of *Schistosoma japonicum* from its Snail Host, *Oncomelania nosophora*, in Japan.** *Japanese J. Med. Sci. & Biol.* 1954, Feb., v. 7, No. 1, 25–37, 4 figs.

" *Oncomelania nosophora* infected with *Schistosoma japonicum* were submerged in water and the shedding of its cercariae during the course of time was observed. The experiments were made at the end of May and September.

" The average number of liberated cercariae as well as the total cercariae from single snails was found larger in the May experimental series than in the September series.

" In average, about 80–85% of all cercariae with fully developed furcal rami were found liberated within 90–119 hours after submerging snails into water. About 66% of all snails showed the initial shedding of cercariae within 9–10 hours and about 90% of them within 21–22 hours after they were submerged. About 17% of all snails showed the largest number of liberated cercariae within 9–10 hours, 70% within 21–22 hours and 90% within 40 hours after being submerged.

" The critical factor in the liberation of cercariae is considered to depend chiefly on a lapse of time after the snails are submerged in water. No marked difference was observed between the liberation of cercariae during the daytime and the night.

"The snails either liberated cercariae successively with short intervening periods of cessation or such a series was repeated intermittently. In the latter case, two or more liberation periods were seen and the number of liberated cercariae at the first liberation period was much larger than the total number of all cercariae liberated later.

"In average about 30% of all liberated cercariae were found within 6 hours after the initial cercariae were shed, about 80% of them within 24 hours. And in average, about 60–70% of all liberated cercariae were found within 24 hours after submerging snails into water and about 80–90% of them within 48 hours."

Wolford, J. L. & Rumball, J. M. **Schistosomiasis Japonica untreated Ten Years after Exposure.** Report of a Case. *J. Amer. Med. Ass.* 1954, July 17, v. 155, No. 12, 1045–6, 2 figs.

"Schistosomiasis japonica was quite prevalent among the prisoners-of-war who remained in the Philippines during World War II. The ordinary stool examination often fails to reveal the schistosomes even when done carefully by trained personnel, particularly in patients who have harbored the disease for several years. This case illustrates the importance of rectal biopsy technique in looking for schistosomes. It should always be considered in any person who has been in the endemic areas who has vague complaints or has an enlarged liver. The sigmoidoscopic appearance of the mucosa is not characteristic, but is not a normal finding and should also make one suspicious. Liver biopsy is also diagnostic if the eggs are seen, though this method of diagnosis is not advocated as a routine procedure. Therapy at this stage may prevent further permanent damage."

Ritchken, J. & Gelfand, M. **Katayama Disease, Early Toxaemic Stage of Bilharziasis with a Report on a Case showing Pulmonary Infiltration.** *Brit. Med. J.* 1954, June 19, 1419–20.

It is here pointed out that although many months may elapse between entry of schistosome larvae into the body and the development of recognizable disease, there is a minority of cases in which the symptoms develop approximately 1 month after infection. The condition at that time is referred to as the Katayama syndrome or the early toxaemic stage of schistosomiasis. This is more common in patients infected with *Schistosoma japonicum* than in those with *S. mansoni* or *S. haematobium*.

There follows a detailed description of a case and a résumé of the main features of the disease. Regarding the latter it is stated that the toxaemic stage is seen in children but not in adults and only a small proportion of infected children develop toxaemic symptoms. Pyrexia may last for several days but more usually it is spasmodic and there are long apyrexial intervals. There is malaise, anorexia, vomiting, eosinophilia, and if the lungs are involved there is also cough. In some cases there is tenderness of the liver, loss of weight, urticarial eruptions, and towards the end of the toxaemic stage, splenomegaly. In the case reported, radiology revealed miliary lesions in the lungs and it is thought probable that such lesions are usually present but have escaped notice because the chest is seldom examined radiologically in such cases.

It is suggested that the clinical features here described are most probably part of an allergic reaction to the developing schistosomes. In the case

reported the toxaemic stage appeared 35 days after exposure to infection and it is well known that fully developed female schistosomes may be found in persons infected 4 to 6 weeks previously. There follows a brief but valuable review of the literature relating to the pathogenesis of pulmonary eosinophilia in schistosomiasis and other helminthic infections. The authors state that, as far as they know, no studies of the sputum have been made on patients in the toxaemic stage of schistosomiasis. They consider it unlikely that the transient pulmonary infiltration and other symptoms of the syndrome could be caused by cercariae trapped in the lung capillaries, nor could the symptoms be caused by migrating schistosomes. There is, they state, no evidence that mature schistosomes migrate anywhere but to the vesical and intestinal venous plexuses. All extra-urinary and extra-intestinal forms of schistosomiasis are due to embolization of ova from the above sources. If the Katayama syndrome was due to cercariae trapped in the lung capillaries symptoms would be expected almost immediately after infection and not 3 to 4 weeks later. *A. W. Woodruff*

Lemoine, J. La forme septicémique de la distomatose hépatique. [**Septicaemic Form of Hepatic** *Fasciola* **Infection**] *J. Méd. de Bordeaux.* 1954, July, v. 131, No. 7, 674–7. [10 refs.]

A case in Bayonne.

Rucci, E. Conservazione ultradecennale di uova di elminti. [**Prolonged Preservation of Helminth Eggs**] *Giorn. di Batteriol. e Immunol.* 1954, July–Aug., v. 47, Nos. 1/2, 45–7, 1 fig.

The English summary appended to the paper is as follows:—

"The author observed the excellent state of conservation of Botriocephalus eggs in a faecal material, to which glycerol had been added 36 years ago."

Silverman, P. H. **Studies on the Biology of some Tapeworms of the Genus** *Taenia.* **I.—Factors affecting Hatching and Activation of Taeniid Ova, and some Criteria of their Viability.** *Ann. Trop. Med. & Parasit.* 1954, June, v. 48, No. 2, 207–15, 6 figs. on pl. [21 refs.]

"1. The literature on laboratory methods of hatching certain cyclophyllidean ova and of activating the hexacanth embryo is reviewed.

"2. The ova of cestodes belonging to the family Taeniidae require a combination of stimuli different from those required for the hatching of ova of the families Anoplocephalidae, Davaineidae, Dilepididae and Hymenolepididae. For the family Taeniidae such stimuli are related to the nature of (*i*) the embryophore and (*ii*) the membrane enclosing the hexacanth embryo, which we have designated the 'oncospheral membrane'.

"3. Taeniid ova require a protease for the disintegration of the embryophore and the hatching of the hexacanth embryo still enclosed in the oncospheral membrane. A combination of lypolytic substances is necessary, however, to increase the permeability of the oncospheral membrane, following which the hexacanth embryo is stimulated to activity, becoming motile and tearing its way out by means of hooks.

"4. The rôle of pancreatin, trypsin, bile salts and cholesterol in hatching and activating the embryo is studied and described.

" 5. The hatching requirements of *Taenia saginata* ova are shown to differ from those of *T. pisiformis*. *T. saginata* requires pretreatment with gastric juice before intestinal juice can effect the disintegration of the embryophore and activation of the embryo, while *T. pisiformis* may be digested and activated when placed directly into intestinal juice.

" 6. Three criteria for determining the viability of taeniid ova are described: (*i*) the motility of the hexacanth embryo, (*ii*) the cytoplasmic and external appearance of the oncosphore, and (*iii*) its reactions to vital staining."

Saiz Moreno, L. Aspecto sanitario de la hidatidosis y orientaciones para su profilaxis. [**Sanitary Aspects of Hydatid Disease and Observations on Prophylaxis**] *Rev. de San. e Hig. Pública.* Madrid. 1954, Mar.–Apr., v. 28, Nos. 3/4, 160–76.

Patel, J. C. **Ankylostomiasis in India: a Review with Suggestions for Future Research.** *Indian J. Med. Res.* 1954, Apr., v. 42, No. 2, 279–304, 1 folding map. [Numerous refs.]

Ebert, H. Durch Askaridenbefall verursachtes flüchtiges eosinophiles Lungeninfiltrat bei mehreren Familienmitgliedern. [**Transient Lung Infiltration with Eosinophilia due to *Ascaris* Invasion in Several Members of a Family**] *Ztschr. f. ärztl. Fortbildung.* 1954, July 1, v. 48, No. 13, 442–4, 3 figs.

In 3 members of a family—parents and a sister-in-law—there occurred an illness with X-ray signs of pulmonary infiltration and also eosinophilia. The children remained well but there was evidence of eosinophilia although X-ray examination of the lungs proved to be negative. The condition of this family was ascribed to *Ascaris* invasion due to the consumption, over a period of 14 days, of strawberries from the family garden which had received surface manuring, for although no *Ascaris* eggs were found in the faeces at the beginning of the illness they were demonstrated 6 to 8 weeks later.

The clinical picture and X-ray findings are recorded. The father was first taken ill with headache and pains in limbs and joints. These symptoms disappeared without treatment after a few days. About a week later he developed a cough and some fever and remained in bed. There was also some pain in the chest but that and the fever subsided a few days later. The patient, who was a doctor, then felt fit for work but for safety's sake had his chest X-rayed, when the lung infiltration was discovered.

M. E. Delafield

Brumpt, L. C. & Ho Thi Sang. Activité de la diéthylcarbamazine (hétrazan, notézine, banocide) contre les nématodes intestinaux. [**Activity of Diethylcarbamazine against Intestinal Nematodes**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 170–78. [20 refs.]

Diethylcarbamazine in addition to being a filaricide has been shown by several workers to be therapeutically active against some human intestinal

worms, particularly *Ascaris lumbricoides* [this *Bulletin*, 1953, v. 50, 433, for other references; also 1954, v. 51, 617].

The authors, in an effort to find a drug suitable for the treatment of severe cases of ankylostomiasis, which also would serve as a general intestinal vermifuge, treated some 60 Vietnamese hospital patients with Notézine (diethylcarbamazine). The dosage employed was 10 mgm./kgm. daily by mouth for 5 days; starvation, purgation, and other special measures were unnecessary to the treatment. Some toxic side-effects resulted; these took the form of headache, vertigo, nausea and vomiting, abdominal pain, and anorexia and asthenia; so the treatment was not suited to ambulant patients.

The action of the drug on ascarids appeared to be a contact one, that is within the intestine; the drug apparently was vermifugal rather than vermicidal to them. On hookworm, on the other hand, the drug seemed to act through its presence in the blood stream and so by absorption in the feeding process, and not directly by contact with the worms within the bowel.

Of the 60 patients infected with *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Trichuris trichiura*, either as single or multiple infections, 50 per cent. were freed of their *Ascaris* infections, but none was entirely freed of the other 2 parasites. But, as judged by careful search of the stools for actual worms and by egg counts over a period of more than 10 days after treatment, 70 per cent. of ascarids were removed from all the treated persons, and 15 to 20 per cent. of ankylostomes; whipworms were not appreciably reduced in number by the treatment. In the case of a child, 6 years old, with an infestation with 365 ascarids treatment caused a marked painful enlargement of the liver with jaundice and a neutrophile leucocytosis; this possibly was due to migration of the worms into the bile ducts.

The authors direct attention to the fallacy of stool examination immediately after treatment in the assessment of results. Eggs may then have vanished from the stools, to reappear in their original numbers 10 or more days later.

A. R. D. Adams

East Africa High Commission. **Filariasis Research Unit Departmental Annual Report No. 5 1953** [Laurie, W., Director]. 22 pp., 3 figs. 1954. Nairobi: Govt. Printer.

This report continues the work already described in previous reports for 1951 and 1952 [this *Bulletin*, 1953, v. 50, 45; 1954, v. 51, 819].

Field surveys have been made in Tanganyika Territory as follows:— Central Province (Singida, Dodoma, Mpwapwa, etc.), filarial rate 0–4 per cent.; Eastern Province (Kilosa, Mahenge-Ulanga, etc.), filarial rate 39–57 per cent. (except for 8 per cent. in Mgeta), Tanga Province (Handeni), filarial rate 1–12 per cent.; Lake Province (Shinyanga and Geita), rate 10–40 per cent.

In general, bancroftian filariasis occurs only where high humidity is combined with high temperature. In districts where *W. bancrofti* is common, hydrocele is also common. Among the places mentioned above, Dipetalonema infection was common only at one, Ilonga. Onchocerciasis was not seen although probably small foci occur in the Kilosa District. In East Africa, the chief disabilities caused by bancroftian filariasis are due to hydrocele, and to the recurrent attacks of fever, pain and lymphadenitis. Elephantiasis, *per se*, is of less importance.

Further experience has confirmed the general finding that adequate treatment with Hetrazan [diethylcarbamazine] produces a great diminution in the microfilaria count of the blood, which remains permanently low.

When cases of elephantiasis are treated, there is seldom any appreciable diminution in size of the affected part but the periodic attacks of lymphangitis, etc. are abolished or greatly reduced (which is of great benefit to the patients); similarly with cases of hydrocele.

Neostibosan was given to 20 patients with genital filariasis or elephantiasis of the legs, the dose being 70 mgm. per kgm. body weight during 8 days. Eight months later, 9 were improved, in 8 there was no change, and 3 were worse. Similar results were obtained in a series of patients treated with solustibosan.

The studies on Ukara Island in Lake Victoria were completed. *Anopheles gambiae* and *A. funestus* are almost entirely responsible for the transmission of *W. bancrofti* infection. A small amount may be transmitted by *A. pharoensis*. Various interesting studies were made on the resting place of these mosquitoes inside and outside huts; for the results, the original report should be consulted.

For onchocerciasis, 20 patients were treated at Kakamega in Kenya and have been followed since. Their symptoms and signs both in the skin and in the eyes disappeared but microfilariae of *Onchocerca volvulus* continued to be found in the skin snips. There were the usual allergic reactions at the beginning of treatment; 122 patients were treated with neostibosan in a total dose of 40–70 mgm. per kgm. spread over 10 days. This was well tolerated and there were only slight immediate allergic reactions. In most cases the skin continued to contain live microfilariae. It appeared that the skin and the eyes had become desensitized as a result of treatment.

F. Hawking

Dassanayake, W. L. P. **A Follow-Up of 230 Cases of Bancroftian Filariasis treated with Hetrazan at the Filariasis Clinic at Dehiwala, Ceylon.** *Ann. Trop. Med. & Parasit.* 1954, June, v. 48, No. 2, 123–6.

Since June 1949 diethylcarbamazine has been used extensively to reduce or eliminate the numbers of microfilariae from the peripheral blood of the inhabitants of the controlled areas of filariasis in Dehiwala, Ceylon. Detection of infected persons is undertaken by means of blood films of the population taken at night, aided by special propaganda carried out with the help of cinematograph lectures and film strips. Persons whose blood is found to be positive are notified, visited by a public health inspector and advised to attend the filariasis clinic where they are issued with tablets of diethylcarbamazine. Under the Mosquito-Borne Diseases (Prevention) Regulations legal provision is made to compel persons with microfilariae to undergo this treatment.

Of the 230 persons with microfilariae 121 (52·6 per cent.) had no signs or symptoms, 93 (40·4 per cent.) had adenitis of inguinal, and 16 (6·9 per cent.) of epitrochlear glands. The dosage of diethylcarbamazine was 300 mgm. daily for 7 days. Of those treated 37 complained of headache and 4 of vomiting; 16 (6·9 per cent.) passed roundworms after the treatment.

The period of observation extended from the middle of 1949 to the end of 1952 at Dehiwala, an area of 6½ square miles with a population of 75,000. There is no pipe-borne water supply or a water sewerage system.

All actual and potential mosquito-breeding places were treated with a suitable larvicide and these measures resulted in a remarkable reduction in mosquito density. Whereas the number of mosquitoes per dwelling was reduced from 2 to 0·2 the infection rate was reduced to about half (from 10·6 per cent. to 5·4 per cent.). After a single course of diethylcarbamazine 127 (55 per cent.) of the treated persons no longer showed

microfilariae in the blood, while 87 per cent. showed a reduction of more than three-quarters in the microfilariae in the peripheral blood.

[The lack of supervision, which is admitted, surely militates against the accuracy of these figures. The taking of the drug was not supervised and there is no guarantee that the tablets of diethylcarbamazine were actually swallowed.] *Philip Manson-Bahr*

DE GLANVILLE, H. *Onchocerca volvulus* **in a Paratyphoid Abscess.** [Memoranda.] *Brit. Med. J.* 1954, July 24, 214.

An African girl of 14 in the Gold Coast suffered from a tender area on the inner side of the right thigh, together with an irregular pyrexia, for 4 weeks. An abscess formed slowly and there was no response to penicillin.

The abscess was found to contain fragments of an adult filarial worm which was identified as *Onchocerca volvulus*. Repeated skin smears were negative for microfilariae.

The abscess also contained *Salm. paratyphi C* in pure culture, but this organism could not be isolated from the stool. The patient made an uninterrupted recovery after evacuation of the abscess. Although paratyphoid C infection is not uncommon as a cause of fever in children in Accra, no history was given which suggested such an illness.

The author refers to the few previous records of suppuration in onchocerciasis nodules and of the presence of the worms in deep abscesses [this *Bulletin*, 1921, v. 17, 86; 1922, v. 19, 228; 1947, v. 44, 924]. He notes the negative skin tests, absence of nodules, finding of a single worm and the unusual infecting organism in this case and speculates on whether the presence of the worm was coincidental or whether it provided a nidus for the infecting organism. *H. J. O'D. Burke-Gaffney*

See also p. 1194, TOULANT & BOITHIAS, Les lésions vasculaires de la rétine dans l'onchocercose africaine [**Vascular Lesions of the Retina in African Onchocerciasis**]

RAMANUJACHARI, G. & ALWAR, V. S. **Indian Pig** (*Sus scrofa domestica*) **as a Host for** *Onchocerca* **sp. and** *Enterobius vermicularis*. Reprinted from *Indian Vet. J.* 1953, Jan., v. 29, No. 4, 329.

No *Onchocerca* have been so far recorded in pigs. The authors, in a survey of porcine helminths in Madras, found two cases of atheromatous lesions of the aorta. From one, which showed naked-eye lesions, worms identified as *Onchocerca* were recovered by dissection, but owing to incompleteness of the specimens, the species could not be differentiated.

They also found a single female pin-worm in the colon of an Indian pig. The specimen agreed in all respects with the description of *Enterobius vermicularis*. The latter is thought to confine itself to man, its only known natural host.

The infection of pigs with these two helminths is believed to be a new record. *H. J. O'D. Burke-Gaffney*

DEFICIENCY DISEASES

Someswara Rao, K., Taskar, A. D. & Ramanathan, M. K. **Nutrition and Haemoglobin Surveys in Children in Nilgiris District.** *Indian J. Med. Res.* 1954, Jan., v. 42, No. 1, 55–75, 1 graph. [40 refs.]

This paper records the results of a survey of 2,293 children. Heights and weights, thickness of skin folds and haemoglobin levels were measured. A detailed clinical examination of each child, following an elaborate nutritional assessment schedule, was made. The data appear to have been recorded with meticulous accuracy and are well set out. Their chief value lies in their future use, when they will provide an excellent yardstick with which to assess changes in the nutritional status of Nilgiris children.

A similar, but less comprehensive survey, was carried out in the Nilgiris in 1936 by Aykroyd and Rajagopal [*Bull. Hyg.*, 1938, v. 13, 7]. In the interval there appears to have been no significant increase in the heights and weights of the children, which remain well below accepted British and American standards. The incidence of angular stomatitis and phrynoderma is distinctly less in the recent survey, but that of Bitôt's spots has shown a slight increase. Thus there would appear to have been no substantial change in the condition of the children in this part of India which remains, as it was, far from satisfactory.

The paper includes a useful discussion on the practicability of recording certain physical signs in routine clinical surveys. *R. Passmore*

Udani, P. M. **Muscle Changes in Malnutrition and a Syndrome of Nutritional Myopathy in Children.** *Indian J. of Child Health.* 1954, Apr., v. 3, No. 4, 167–76, 2 text figs. & 6 figs. on 2 pls. [18 refs.]

Muscle wasting associated with hypotonia is a common feature in most cases of malnutrition. But in severe cases, as the malnutrition advances, there gradually occurs some stiffening and shortening of the muscles. Affected muscles are tender and both the muscle belly and tendon may stand out prominently. The muscles of the thigh are especially involved. On histological examination atrophy of muscle fibres was seen with diminution or disappearance of sarcoplasm and of the longitudinal and transverse striations of the fibres. In some there was complete absorption of the myofibrils. Hyalinization and granular degeneration of muscle fibres were also seen, together with an increase of fibrous and connective tissue. [Unfortunately the reproduction of the microphotographs is so poor that it is impossible to make out these points on the plates.] The changes were found in cases of apparently primary malnutrition, as well as in cases secondary to tuberculosis and other infections. *R. Passmore*

Welbourn, Hebe. **The Danger Period during Weaning among Baganda Children.** *East African Med. J.* 1954, Apr., v. 31, No. 4, 147–54, 2 figs.

Weights and lengths of children attending child welfare clinics in Uganda have been recorded. For the first 6 months of life the Baganda babies thrive, and 2 growth curves show that both boys and girls grow at the standard rate for American children. Thereafter the Baganda curves fall below the American. This is because the maternal milk supply can then no longer suffice for the increased needs of the child. Mixed feeding is introduced too late and the food is of poor quality. The growth rates of babies of well educated parents did not fall off to the same extents as others.

R. Passmore

Lanzo, A. La proteinemia del nativo eritreo in condizioni normali ed in alcune condizioni patologiche. (Studio su 227 casi.) [**The Blood Proteins of Eritreans in Normal Circumstances and in Certain Pathological States. (A Study of 227 Cases)**] Estratto dagli Atti I. Congr. Interregion. Estafricano, Asmara, 30 mar.–5 apr. 1952. *Boll. Soc. Ital. di Med. e Igiene Trop. in Eritrea.* Special Number. pp. 78–88. English summary.

For his estimations Lanzo has used the Greenberg technique, salting with sodium sulphate (Howe) and adding phenol as a reagent, the colour being read in a Lumetron photo-electric apparatus. He has found that this method gives as good results as Howe's micro-Kjeldahl technique. All the subjects whom Lanzo studied were sick people, but 52 of his patients suffered from diseases which do not involve the protein metabolism and which were of short duration, and it is this group which he treats as normal as far as blood proteins are concerned. This group consisted of persons of each sex, aged from 18 to 50 years. The values in these were more or less the same as those found in similarly " normal " European subjects.

The average findings in gm. per 100 ml. were as follows:—

	Number of Persons	Total Proteins	Albumins	Total Globulins	Albumin/ Globulin Ratio
" Normal "	52	7·25	4·43	2·82	1·92
Tuberculosis					
Abdominal 8					
Pulmonary 5 ...	13	6·85	3·42	3·43	0·99
Splenomegaly					
Malarial 12					
Others 6 ...	18	6·45	2·83	3·63	0·78
Undulant Fever ...	24	6·64	3·45	3·19	1·08

The average albumin-globulin ratio was 0·715 among 15 patients with acute or chronic nephritis, 1·332 among 18 patients with acute hepatitis of the epidemic or the toxic type, 0·795 among 20 cases of chronic hepatitis which included syphilitic, malarial, cirrhotic and cancerous types.

A wide range of other diseases was investigated and included malnutrition, leprosy, diabetes, helminthiasis, amoebiasis and pneumonia. The results of protein estimation in all these cases are tabulated.

Lanzo concludes that an increase in the total globulins with an inversion of the albumin-globulin ratio may assist diagnosis when other symptoms and signs are not very evident and disease is in an early stage. The protein deficiency which is so common in the diet of the people of Eritrea does not markedly affect the amount of blood protein in " normal " subjects, but it does frequently alter the albumin-globulin ratio in a wide variety of pathological conditions. *J. Cauchi*

Mariani-Tosatti, G. Sindrome di malnutrizione da carenza proteica nel bambino eritreo. [**Malnutrition Syndrome from Protein Deficiency in the Eritrean Child**] Estratto dagli Atti I. Congr. Interregion. Estafricano, Asmara, 30 mar.–5 apr. 1952. *Boll. Soc. Ital. di Med. e Igiene Trop. in Eritrea.* Special Number. pp. 89–106, 14 figs. on 13 pls. [13 refs.] English summary.

The author has chosen the above label for the condition which, he states, resembles that which has been described in recent years from various parts of Africa and Asia as kwashiorkor or under other, generally indigenous,

names. He reports 7 cases, which he has seen in the Eritrean Highlands, and gives their history, the results of clinical and laboratory examinations and of treatment. One of the cases proved fatal and the post-mortem findings are reported. The appearance of some of the patients is illustrated in a number of photographs.

The condition is characterized by initial gastro-intestinal disturbances, severe malnutrition, such skin changes as "crazy pavement" and furfuraceous desquamation, cheilosis, atrophic glossitis, reduction of the blood proteins, changes in the hair, retarded physical and mental development, and oedema. Nevertheless, the author makes a distinction between this condition and kwashiorkor largely on the ground that the hair changes said to be characteristic of kwashiorkor are rare, and oedema is the prominent feature.

The author discusses the indigenous dietary and the locally available food supply, which in 1950 allowed a daily average of only 1,574 calories per head as against a daily requirement of 2,269 calories! Under such circumstances there are advantages in the local custom whereby women breast-feed their children up to the age of 18–20 months; an increasing number of women are tending to wean their infants at an earlier age and to feed them on an unsuitable and inadequate diet, mostly cereal, under very insanitary conditions. The deficiency of protein intake is accompanied and followed by other disturbances of metabolism involving fats and carbohydrates and producing an inversion of the albumin-globulin ratio. The condition affects the hormonal system and this results in a retardation or arrest of development. In the absence of treatment oedema supervenes and often inanition and death.

When possible, diagnosis should be confirmed by liver biopsy. Otherwise the therapeutic test of a diet rich in protein should be relied on for a specific confirmation of the diagnosis. *J. Cauchi*

Thompson, M. D. **Protein Shortage in African Children: some Causes and Effects.** *East African Med. J.* 1954, Apr., v. 31, No. 4, 127–42, 2 figs.

Vast numbers of children in East Africa are subsisting on diets containing marginal amounts of protein. This paper is a critical discussion of factors which may tip a delicate balance between protein intake and requirements so that a deficiency occurs and the clinical condition known as kwashiorkor becomes manifest. Infections play an important rôle in causing the onset of symptoms. They may affect protein balance by putting up requirements (as in fever), reducing intake (as a result of anorexia) or increasing losses (from diarrhoea or chronic sepsis). Whether or not heavy hookworm infections cause an increased protein loss in the faeces and so put up requirements is discussed but left an open question. Once kwashiorkor is present, a vicious circle is set up by the anorexia and the diarrhoea, which results from the failure to secrete a sufficiency of the digestive enzymes. Infections may also determine in part the nature of the clinical manifestations of kwashiorkor, which are known to be so variable. Thus during an epidemic of measles, generalized skin manifestations were especially common. Hookworm infection by increasing the need for protein for blood formation may further reduce low serum protein levels and so aggravate oedema.

This paper presents many interesting examples of the effects of infections on clinical kwashiorkor. It is an aspect of the disease which has considerable bearing on both treatment and prevention. *R. Passmore*

Srinivasan, P. R. & Ramanathan, M. K. **Protein and Sulphur Amino Acids in Breast-Milk of Poor Class Indian Women in the Nilgiris.** *Indian J. Med. Res.* 1954. Jan., v. 42. No. 1, 51–4. [12 refs.]

The results of the milk analyses can be summarized as follows:—

	Protein gm./100 cc.	Methionine mgm./100 cc.	Cystine mgm./100 cc.
Average values for 25 healthy mothers ...	1·27	29·1	19·0
Average values for 6 mothers with children suffering from kwashiorkor	1·59	30·4	26·1

These analyses revealed no defect in the quality of the milk of the women whose children developed kwashiorkor, but no assessments of the quantity of milk, which the children obtained, were possible. *R. Passmore*

Chandra, H. **A Problem of Malnutrition "Kwashiorkor Syndrome".** *Indian J. of Child Health.* 1954. Apr., v. 3. No. 4. 161–6. 1 fig. [25 refs.]

This paper describes the clinical aspects of 139 cases of kwashiorkor seen in a children's hospital in Hyderabad, Deccan. The account differs in no substantial way from well-known descriptions from Africa, except that the age incidence is somewhat later. The maximum incidence, 29 per cent. of the cases, appeared in the third year. There was a mortality of 15 per cent.: most of the deaths occurred within 24 hours of admission.

R. Passmore

Monnerot-Dumaine, M. La terminologie du kwashiorkor. [**The Terminology of Kwashiorkor**] *Bull. Soc. Path. Exot.* 1953. v. 46. No. 6. 974–6.

This brief note discusses various names given to this disease and gives a list of the names used by the indigenous people of the Belgian Congo. The author, like many others, would prefer a scientific title and suggests *stéatose hépatique carentielle de sevrage*. [In discussion it was pointed out that the disease did not occur only after weaning. It is, however, so commonly found at this time that this does not seem a serious objection. A more practical difficulty is that, though concise and elegant enough in French, it does not translate easily. "Food-deficiency fatty degeneration of the liver of weaning" is an awkward mouthful.] *R. Passmore*

Richet, C. A propos de la terminologie du kwashiorkor. [**The Terminology of Kwashiorkor**] *Bull. Soc. Path. Exot.* 1954. v. 47. No. 2. 195.

The author objects to the title *stéatose hépatique carentielle de sevrage* suggested by Monnerot-Dumaine [see above] because the fatty degeneration is not necessarily due to absolute diminution in the amount of dietary protein, but rather to a general alimentary disequilibrium and also because the disease occurs in adults. The name "malignant malnutrition" is perfectly suitable. The title "fatty degeneration and cirrhosis of bad nutrition" also

appears comprehensive and definitive. [As the great majority of cases of kwashiorkor respond very well to suitable treatment, it cannot accurately be described as malignant.] *R. Passmore*

HAEMATOLOGY

McGregor, I. A. & Deegan, T. **Erythrocyte Sedimentation Rates in Gambian Africans.** *Ann. Trop. Med. & Parasit.* 1954, June, v. 48, No. 2, 220–27.

The authors determined the erythrocyte sedimentation rate in 162 Africans from the Gambia. Heparinized blood was investigated by the Wintrobe method which allowed a correlation between speed of sedimentation and packed-cell volume. There was no difference between 135 persons who were engaged in their normal agricultural duties and were apparently healthy, and 27 presumably ill people attending a dispensary. Presence of circulating malaria parasites had no influence on the sedimentation rate. As in Europeans there was a higher rate in women than in men. The sedimentation rate was in nearly all cases considerably higher than is considered normal in Europe. This was so even in non-anaemic persons with a normal packed-cell volume and in anaemic subjects when correction for low packed-cell volume was made by the Wintrobe and Landsberg chart. The authors rightly remind the reader that the sedimentation rate depends on the albumin-globulin ratio, and that it is likely that this ratio was different in these inhabitants of the Gambia from the ratio considered normal in Europe. *H. Lehmann*

Ellis, B. C. **A Comparison of the T1824 Blood Volume at Sea-Level and an Altitude of 5,740 Feet in Normal South African European Males.** *South African J. Med. Sci.* 1954, June, v. 19, Nos. 1/2, 11–14. [13 refs.]

"1. The results of single blood volume estimations on 20 healthy South African European males who were living at sea-level are presented. The plasma volume was 43·5 ± 0·77 ml./kg., the red cell volume 36·6 ± 0·82 ml./kg. and the total blood volume 80·1 ± 1·42 ml./kg. These values fall within the normal range given for sea-level values elsewhere.

"2. When the results of the Cape Town (sea-level) and Johannesburg (5,740 feet) series are compared the differences previously suspected [Ellis, 1953] are confirmed. Comparison of the ml./kg. values shows that at Johannesburg the plasma volume is reduced by 9·7 per cent, the total blood volume is lower by 6·2 per cent and the red cell volume is essentially the same as at Cape Town.

"3. Altitude difference appears to be responsible for these changes and it is suggested that the haemoconcentration at a moderate altitude corrects the associated relative anoxia and as a result no increase in the red cell mass occurs."

See also p. 1143, Allison, **The Distribution of the Sickle-Cell Trait in East Africa and Elsewhere, and its Apparent Relationship to the Incidence of Subtertian Malaria.**

Edington, G. M. & Lehmann, H. **A Case of Sickle Cell—Haemoglobin C Disease and a Survey of Haemoglobin C Incidence in West Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, July, v. 48, No. 4, 332–6, 2 figs. [16 refs.]

U.S.A. Negroes differ from their fellow citizens by showing an appreciable incidence of S (sickle-cell) haemoglobin. It has recently been found that they also possess another haemoglobin which has been called haemoglobin C. C does not give rise to sickling but can often be associated with the target-cell phenomenon. Like S haemoglobin, C can be discovered by electrophoresis where it becomes separated from both S and normal (A) haemoglobin. Persons who are heterozygous for A and C are normal, homozygotes for C (CC) suffer from a mild haemolytic anaemia, heterozygotes for S and C (SC) present with sickle-cell anaemia though the disease is modified; they are said to suffer from "sickle-cell—haemoglobin C disease".

The present article reports the first finding of C in Africa. Of 10 anaemia patients examined, 2 had the sickle-cell—haemoglobin C disease and one was homozygous for C. In a random survey of 200 out-patients in Accra 21 instances of AC, 2 of SC and one of CC were found. There was thus in this random sample an over-all frequency of 12 per cent. for the C gene, which can well compare with that of 20·5 per cent. for the S gene found in these 200 persons. *H. Lehmann*

Wolf, J. & Levy, I. J. **Treatment of Sickle-Cell Anemia with Cobalt Chloride.** *Arch. Intern. Med.* 1954, Mar., v. 93, No. 3, 387–96, 2 charts. [59 refs.]

After briefly outlining the clinical features of sickle-cell anaemia and new work on haemoglobins, the authors state that they tried cobalt chloride in cases of sickle-cell disease because of its reported value in Mediterranean anaemia. They aimed not to prevent crises but to raise the haemoglobin in patients with chronic sickle-cell anaemia. It is pointed out that cobalt may cause an increase in haemoglobin in chronic anaemia secondary to infection, carcinoma, uraemia, leukaemia or lymphoma. In rats it will not produce polycythaemia if iron deficiency exists, and it is therefore suggested that it exerts its stimulating effect by increasing the utilization of iron. An alternative suggestion is that it produces bone-marrow anoxia by interfering with the action of respiratory enzymes and that from this the stimulus to haemoglobin formation results.

Studies were carried out in 4 patients who had been observed for several years and to whom numerous forms of treatment had been given without effect. After a control period, 12 ml. of a 2·5 per cent. aqueous solution of cobalt chloride was given orally in 3 divided doses daily for 6 weeks. During the last 2 weeks of this period 1·8 gm. ferrous sulphate was also administered orally daily. Medication was then discontinued.

In all cases a reticulocyte crisis occurred within 7 days of commencing treatment and a secondary crisis developed 2 weeks after the first. On admission the haemoglobin values ranged from 8·7 to 11·2 gm. per 100 ml. blood, the range after 6 weeks of treatment was 12·0–15·5 gm. per 100 ml. blood. After cessation of treatment the blood values dropped. The longest interval after which observations are reported following treatment is 4 weeks, and during this period the haemoglobin in this case had fallen from 12·0 to 10·6 gm. per 100 ml.

Side effects observed by the authors in patients being treated with cobalt include gastro-intestinal irritation, erythema multiforme and urticaria.

The conclusion is reached that treatment with cobalt may be an effective means of improving chronic anaemia in patients with sickle-cell disease.

A. W. Woodruff

EPIDEMIC DROPSY

Lal, S. B. **Effect of Argemone Oil on Monkeys.** *Indian Med. Gaz.* 1954, Feb., v. 89, No. 2, 71–4, 5 figs. on 2 pls.

"Oral administration of argemone oil mixed in mustard oil caused the appearance of oedema and other symptoms resembling epidemic dropsy in all the six monkeys of which three died. Lower concentration of the oil up to 3 per cent did not produce oedema or cause death in 34 days and irrespective of the initial concentration the animals did not show any of the manifestations in the first two weeks except apathy to food in two cases only."

VENOMS AND ANTIVENENES

Fischer, F. G. & Neumann, W. P. Die elektrophoretische Analyse der Gifte von *Naja haje* und *Naja nigricollis* (Schlangengifte II). [**Electrophoretic Analysis of the Venom of** *Naja haje* **and** *N. nigricollis*] *Hoppe-Seyler's Ztschr. physiol. Chem.* 1954, Aug. 6, v. 297, No. 2, 92–9, 8 figs. on 2 pls. [Refs. in footnotes.]

Fischer, F. G. & Neumann, W. P. Die elektrophoretische Analyse der Gifte von *Bitis arietans* und *Echis carinatus* (Schlangengifte III). [**Electrophoretic Analysis of the Venom of** *Bitis arietans* **and** *Echis carinatus*] *Hoppe-Seyler's Ztschr. physiol. Chem.* 1954, Aug. 6, v. 297, No. 2, 100–103.

Habermann, E. Zur pharmakologischen Charakterisierung elektrophoretischer Fraktionen der Gifte von *Naja nigricollis* und *Naja haje*. [**The Pharmacological Characteristics of the Electrophoretic Fraction of the Venom of** *Naja nigricollis* **and** *N. haje*] *Hoppe-Seyler's Ztschr. physiol. Chem.* 1954, Aug. 6, v. 297, No. 2, 104–7.

Tange, Y. Beitrag zur Kenntnis der Morphologie des Giftapparates bei den japanischen Fischen, nebst Bemerkungen über dessen Giftigkeit. V. Über den Giftapparat bei *Hypodytes rubripinnis* (Temminck et Schlegel). [**The Morphology of the Poison Apparatus of Japanese Fishes and Observations on their Toxicity; V.** *Hypodytes rubripinnis*] *Yokohama Med. Bull.* 1954, Feb., v. 5, No. 1, 42–8, 5 figs.

TOXOPLASMOSIS

Silver, H. K. & Dixon, M. S., Jr. **Congenital Toxoplasmosis. Report of Case with Cataract, " Atypical " Vasopressin-Sensitive Diabetes Insipidus, and Marked Eosinophilia.** *Amer. J. Dis. Children.* 1954, July, v. 88, No. 1, Sect. 1, 84–91, 1 fig. [17 refs.]

Eyles, D. E. & Coleman, Nell. Le traitement de la toxoplasmose expérimentale aiguë de la souris par la terramycine. [**Treatment of Acute Experimental Toxoplasmosis in Mice with Oxytetracycline**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 952–3.

The authors refer to the discussion on the paper by Garin [this *Bulletin*, 1953, v. 50, 981], during which Giroud quoted their own work [*ibid.*, 569] as " confirmation of the remarkable action " of oxytetracycline in toxoplasmosis.

They now point out that this does not correctly interpret their findings as, in fact, their results showed that this antibiotic only prolonged survival of the mice significantly, but, even in massive doses, did not cure them.

They show in a table that doses of 500 to 2000 mgm. per cent. given in the diet of 35 mice infected intraperitoneally with toxoplasms resulted in the death of 25 before the end of treatment (the 14th day) while the other 10 lived until the 22nd day. All of 8 untreated controls died by the 9th day.

In discussion, Giroud points out that this is nevertheless an important finding in view of the extreme susceptibility of mice to toxoplasmosis. He has noticed a difference in strain susceptibility to treatment and this may explain the varying results obtained by different workers.

H. J. O'D. Burke-Gaffney

Eyles, D. E. & Coleman, Nell. **The Antitoxoplasmic Activity of Puromycin.** *Antibiotics & Chemotherapy.* New York. 1954, June, v. 4, No. 6, 649–52.

" Puromycin was demonstrated to produce prolongation of life in mice infected with *Toxoplasma gondii*, but treatment for as long as 28 days did not result in survival of mice. All mice eventually relapsed and died of toxoplasmosis or showed *Toxoplasma* organisms at autopsy. On the basis of its activity in mice, it would appear that puromycin is not sufficiently effective to be of practical value as an antitoxoplasmic agent."

DERMATOLOGY AND FUNGUS DISEASES

Simons, R. D. G. Ph. [Edited by.] **Handbook of Tropical Dermatology and Medical Mycology. Vol. II.**

This book is reviewed on p. 1211.

Brown, M. V. **Fogo Selvagem (Pemphigus Foliaceus).** Review of the Brazilian Literature. *Arch. Dermat. & Syph.* 1954, May, v. 69, No. 5, 589–99. [22 refs.]

Fogo selvagem or " savage fire " is an endemic bullous disease found in certain lowland areas of South America. It produces a feeling of being on

fire and is characterized by recurrent crops of bullae followed by crusting and desquamation. Young females under 30 are particularly affected, and often 2 or more members of one family are attacked.

The disease usually begins with a few bullae on face, sternum and back, and sometimes arms and legs. As it progresses the general health deteriorates, but the mucous membranes are spared, even in advanced cases. With the advance of the disease the bullae extend and there is severe erythroderma and intense desquamation. Serous effusion into the large joints often occurs, followed by ankylosis. Muscular atrophy may develop in the chronic phase of the disease and atrophy of the mammae and testicles is very common. Alopecia affecting the scalp, eyebrows, eyelashes, pubes and axillae also occurs. Pyrexia is usual, the temperature being raised at night and normal or sub-normal in the morning. Elephantiasis of the ears, resulting from lymphangitis, is very common. Pigmentation of the skin is usually a favourable sign.

The cause of *fogo selvagem* remains obscure. The patients affected are usually extremely poor and ignorant, and the lowland valleys where the disease is endemic are the home of many mosquitoes, possible vectors of a virus.

Histologically, *fogo selvagem* may show bullae in each of the skin layers with hyperkeratosis, acanthosis, papillomatosis and foci of acantholysis in the granular layer. The author considers that the appearances correspond exactly to those of the Senear-Usher syndrome. Clinically, erythema multiforme and dermatitis herpetiformis (which is rare in Brazil) may be distinguished from *fogo selvagem*. *Pemphigus vulgaris* and *Pemphigus vegetans* appear to be the same in the United States, Europe and Brazil. *Pemphigus foliaceus*, however, is the same in the United States and Europe, but is an entirely different disease in Brazil. In the United States it is usually fatal, whereas 60 per cent. of patients with *fogo selvagem* recover, the mortality being about 40 per cent. *Fogo selvagem*, moreover, commonly affects women and children, whereas children rarely contract *pemphigus foliaceus* and the sex incidence is equal. *Forme fruste fogo selvagem* is, in the author's opinion, identical with the Senear-Usher syndrome.

Treatment consists in combating secondary infection and preventing chilling. Warm water baths and applications of vaseline are used in most cases. The results of corticotrophin and cortisone are at present indeterminate. Mepacrine and oral BCG are sometimes useful.

H. T. H. Wilson

Dejou, L. & Navarranne, P. Les mycétomes. [**Mycetoma**] *Méd. Trop.* Marseilles. 1953, July–Aug., v. 13, No. 4, 449–65, 12 figs.

A general discussion and some personal observations.

Marx, F. J. & Berenbaum, A. A. **Systemic Blastomycosis. Cause of an Obscure Infection in a Nonendemic Area.** *New England J. of Med.* 1954, July 8, v. 251, No. 2, 56–60, 7 figs. [12 refs.]

"An acute fulminating case of systemic blastomycosis with a fatal outcome is presented. The patient, a native of North Carolina, had moved to Philadelphia three months before the onset of the illness.

"Some of the unusual features of this case, including the diagnostic difficulties, management and failure to respond to therapy with stilbamidine are discussed."

MADDY, K. T. **Coccidioidomycosis of Cattle in the Southwestern United States.** *J. Amer. Vet. Med. Ass.* 1954, June, v. 124, No. 927, 456–64, 6 figs. [33 refs.]

Coccidioidomycosis as a natural infection of cattle has been recognized in the United States for many years; PRCHAL (*J. Amer. Vet. Med. Ass.*, 1948, v. 112, 461) identified the infection in 503 cattle slaughtered in Phoenix, Arizona, in one year. The present author observed 2,262 instances of the infection in slaughtered cattle in Los Angeles during the years 1947–1951, and 911 in San Francisco in 1953. The lesions were confined almost entirely to the bronchial and mediastinal lymph nodes but, in a very small number of animals, lesions were found also in the lung and pleura and in the submaxillary, retropharyngeal or the mesenteric lymph nodes. The histopathology of the affected tissue was characteristic of coccidioidomycosis, caseation was present in 84·1 per cent. of the affected nodes, caseation with calcification in 15·7 per cent. and slight calcification in 0·2 per cent. The disease appears to be entirely symptomless.

The infection rate was highest in beef cattle among which, in Los Angeles, 2,228 of the infected animals (2·8 per cent.) were steers or heifers and only 6 (0·07 per cent.) bulls or cows. Dairy cattle were less frequently affected and only 7 steers or heifers (1·5 per cent.) and 4 cows or bulls (0·09 per cent.) were found infected. Among calves of all breeds over 2 months old, only 17 were found infected (0·171 per cent.) and no instance of infection was found among 61,246 calves under 2 months old. Analysis of the returns from San Francisco bore out the relatively high infection rate in beef steers and heifers.

The only factor of epizootiological significance was the exposure of the cattle to dusty conditions on grazing lots in the areas of the *Coccidioides* infection. In the absence of dusty conditions the animals could live on pastures in these areas for years without developing detectable lesions of the disease. The infection is probably contracted by inhalation of the spores of the fungus, as in coccidioidomycosis of man. The author considers that the presence of infected cattle in an area serves to replenish the fungus in the soil and to increase the infection potential.

It was sometimes difficult to determine the probable source of the infection in the individual animal because of the movement of herds in enzootic areas and the possibility of infection through transported fodder, but it was evident that 2,741 of the animals were infected in various parts of California; 211 in Arizona, from the Phoenix and Tucson feedlots; 36 in New Mexico from the eastern part of the state; 23 from western Texas; 17 from the south-eastern corner of Colorado; 4 from the southern border of Oregon, and 141 which had been exposed in more than one area of the infection. The geographical distribution of the sources of cattle infection may furnish valuable additional data in mapping the areas of distribution of endemic coccidioidomycosis of man.

The author advocates the use of the coccidioidin skin sensitivity test on cattle to obtain additional data on the probable time and source of infection.

J. T. Duncan

HAMPSON, C. R. **Sporulation Capacity of *Coccidioides immitis* affected by Cultural Conditions.** *J. Bacteriology.* 1954, June, v. 67, No. 6, 739–40.

In a recent report, FRIEDMAN *et al.* [this *Bulletin*, 1954, v. 51, 222] described variation affecting spore production in cultures of *Coccidioides immitis*, which was attributed largely to the influence of the culture medium.

The present author has investigated the effects on spore formation in *C. immitis*, of the use of screw-capped culture tubes and of incubation at 37°C.

Twenty recently isolated strains of *C. immitis* were grown on "Sabouraud's" glucose agar in screw-capped tubes and in cotton-plugged tubes, and were incubated at room temperature and at 37°C. Only a few of the 20 strains showed gross morphological variation and this took the form of the flat, wet colonies described by Friedman *et al.* However, the production of spores was markedly affected by the use of screw-capped (sealed) tubes and by incubation at 37°C. The proportion of the 20 strains which did not spore in the characteristic manner in screw-capped tubes was 60 per cent. when incubated at 37°C. and 35 per cent. at room temperature; and in the cotton-plugged tubes, 35 per cent. at 37°C. and 10 per cent. at room temperature.

Fresh isolates of *C. immitis* from pus which had been stored in a refrigerator for 15 months, formed typical colonies which spored normally.

Non-sporing strains were pathogenic for mice and formed the characteristic spherules and sporangia in the tissues of the animals. *J. T. Duncan*

TROPICAL OPHTHALMOLOGY

Guerra, P. I problemi delle congiuntiviti acute epidemiche e del tracoma. [**The Problems of Acute Epidemic Conjunctivitis and of Trachoma**] Estratto dagli Atti I. Congr. Interregion. Estafricano, Asmara, 30 mar.–5 apr. 1952. *Boll. Soc. Ital. di Med. e Igiene Trop. in Eritrea.* Special Number. pp. 299–318. English summary.

In East Africa, where the author of this paper has been practising for 16 years, eye disease is responsible for much blindness and loss of work. In 1947 Italy is said to have voted 3,000 million lire [at the present rate of exchange this is over £1,500,000] for a 5-year plan which the author has drawn up for a trachoma campaign. He has investigated cases of acute seasonal conjunctivitis and of trachoma among an aggregate population of 200,000 inhabitants of Eritrea, Ethiopia and Somaliland. [No figures are given and it is said that the investigation included much laboratory research.]

Acute seasonal conjunctivitis is epidemic at the end of the short and the long rains (April and September) when relative humidity is high and temperatures vary widely throughout the day. In Ethiopia the disease is epidemic for 4–5 months each year and is endemic and less severe during the other months.

Bacteriologically, Guerra has found a combination of Koch-Weeks bacillus with a Gram-negative diplococcus of the *Neisseria catarrhalis* type.

In the "classic form" of this conjunctivitis the cornea is involved by the 3rd day and often perforates by the end of the 1st week. Healing may take place in 3 weeks but relapse is frequent. The Koch-Weeks bacillus disappears within the first few days and is believed to be responsible for the conjunctival changes, the corneal damage being due to the *N. catarrhalis*. Ten per cent. of the cases were in an "abortive form", recovering in a few days, with early disappearance of the micrococcus. Generally at the end of an epidemic, about 1 per cent. of cases are associated with a superficial keratitis punctata and follow a sluggish course

offering considerable resistance to treatment; here micrococci can be found from the start and persist for a long time. A " pseudo-membranous form " was observed in 4–5 per cent. of cases: the onset is sudden and a greyish-white membrane forms by the 3rd day with marked palpebral oedema; the membrane can be easily detached but quickly reappears; the cornea escapes. In this last form both organisms are found from the onset and disappear at an early stage, with recovery in 10–20 days.

Two other forms of the conjunctivitis are associated with trachoma. When the latter is already present and active the superimposed conjunctivitis runs a virulent course with serious corneal complications. In about 6 per cent. of cases trachoma supervened after the acute conjunctivitis had set in, the Koch-Weeks bacillus and *N. catarrhalis* being found first and the trachoma inclusions after about one month.

Some epidemics have affected as many as 65 per cent. of the children (under 12 years) and 10 per cent. of the adults in a community and produced complications in about 30 per cent. of the patients.

Guerra has investigated trachoma in a wide variety of races inhabiting 3 East African territories and quotes percentage incidences which he found by country and by race. He has experimentally transmitted the disease to a number of volunteers, obtaining a positive infection in 4 out of 5 Arabs, 4 out of 6 Semitic Shoans, 5 out of 6 of the Galla tribe, 1 out of 5 volunteers of Hamitic race and none out of 3 volunteers of Nilotic race. Guerra points out that there were only 200 treated for trachoma out of 90,000 Italian prisoners-of-war in East Africa where they mixed freely with an African population among whom trachoma prevails.

For mass treatment, Guerra prefers a combination of sulphathiazole internally and the local application of oxytetracycline cream. *J. Cauchi*

See also p. 1164, Falcone, Le complicazioni oculari nella febbre ricorrente da zecca in Somalia [**Eye Complications of Tick-borne Relapsing Fever in Somaliland**]

Toulant, P. F. & Boithias, R. Les lésions vasculaires de la rétine dans l'onchocercose africaine. [**Vascular Lesions of the Retina in African Onchocerciasis**] *Bull. Acad. Nat. Méd.* 1954, v. 138, Nos. 9/10, 141–5. [10 refs.]

In this paper, the authors describe retinal changes which they have observed in patients infected with onchocerciasis associated with damage to the optic nerve. They state that lesions in the optic fundus appear to be responsible for 30 to 40 per cent. of the blindness caused by onchocerciasis, keratitis and iridocyclitis being mainly responsible for the remaining 60 to 70 per cent.

The most outstanding clinical feature of retinal onchocerciasis is the presence of a white sheath around the retinal arteries in the vicinity of the optic disc. The arteries appear thinner than normal and later the sheath becomes 3 to 4 times thicker than the rest of the artery. In long-standing cases the lumen of the artery may become completely obliterated. The veins are often narrow like arteries and in some cases have a thin white border. These vascular changes develop simultaneously with atrophy of the optic nerve, which in turn causes the outline of the optic disc to become abnormally clear, thus resembling the appearance in optic atrophy due to other causes such as tabes, trypanosomiasis or arsenical poisoning. In this study large areas of oedema have been noted in the retina and this is thought

to be evidence that the retinal circulation is disturbed in the disease. Nodular lesions in the retina may also be present; some of these are just visible through the ophthalmoscope, others vary in size up to 2 or 3 times the diameter of the central retinal arteries. The largest usually occur in clusters of 5 to 10 and seem to be attached to blood vessels.

The authors state that unlike other workers they have found atrophy of the optic nerve with periarteritis in patients who have not developed choroiditis or lesions of the anterior chamber of the eye. Optic nerve atrophy is most often bilateral, but it may be more marked on one side than the other, and when it is bilateral one of the eyes may not show periarterial lesions. These retinal changes lead to rapid deterioration of visual acuity, and in long-standing cases to blindness, the pupils then becoming dilated and the pupillary reflexes abolished. Many patients who state that their vision is good are shown by standard tests to have markedly impaired visual acuity. In other cases, it seems that the field of vision only is reduced. It is probable that the periarterial lesions described produce scotomata, but these have not yet been demonstrated. It is suggested that the periarterial sheaths limit penetration of the retina by microfilariae.

Regarding the aetiology of optic atrophy in onchocerciasis, it is pointed out that early workers considered this lesion to be a late manifestation of the disease. In this study, however, it has been found not only in adults but also in young children who have not presented other evidence of onchocerciasis. The situation of onchocercal nodules on the head is considered to be a factor, ocular lesions being more common in those who have a nodule near the eyes. It is also suggested that some local strains of *Onchocerca volvulus* may more commonly produce ocular lesions than other strains. Thus, ocular lesions are most common in the Upper Volta, the region around Lake Chad and in parts of the Belgian Congo. In tropical America, however, onchocerciasis appears seldom to be complicated by optic atrophy. *A. W. Woodruff*

HEAT STROKE AND ALLIED CONDITIONS

Drew, W. R. M. **Effects of Heat.** *J. Roy. Army Med. Corps.* 1954, July, v. 100, No. 3, 187–92.

The author gives a general account of the effects of heat, with particular reference to troops stationed in warm climates.

He discusses the aetiology of heatstroke and heat exhaustion, and the various physical, physiological and mental factors involved. The nature of and need for adaptation are mentioned and descriptions are given of the clinical features of the two conditions. Particular attention is paid to the question of prevention, in the light of modern knowledge, and treatment is summarized briefly.

Colonel Drew illustrates his paper with examples drawn from actual occurrences such as the fate of a draft of troops exposed to trying conditions in Basra, the death from heat of 600 people in a single day during a Mecca Pilgrimage, and cases of heatstroke in Britain in the course of a hot summer.

This is a useful summary of the practical aspects of the effects of heat. *H. J. O'D. Burke-Gaffney*

Lee, T. S. **Physiological Gustatory Sweating in a Warm Climate.** *J. Physiology.* 1954, June 28, v. 124, No. 3, 528–42, 8 figs. [25 refs.]

PARASITOLOGY: GENERAL

Vanni, V. & Ferreira, B. E. El mapa parasitológico de la República Argentina. [**Parasitological Map of the Argentine Republic**] *Rev. Inst. Malbrán.* Buenos Aires. 1950–53, v. 15, No. 4, 369–72, 1 fig. on pl.

As a prelude to a campaign for the control of communicable diseases in Argentina it was decided in 1951 to start work on the elaboration of a parasitological map of the country. This task was entrusted to the authors of this note. First, attention was given to the examination of faecal samples: intestinal parasitism and infections are of outstanding importance to all parts of the country, more especially to the tropical regions of north Argentina. A start was made in the Province of Formosa. Test tubes containing an aqueous 5 per cent. solution of formol were distributed to the technical personnel of schools and hospitals. Freshly passed faecal samples were placed in the tube in the proportion of one part of faecal material to one of the formol solution. In this way the sample can be preserved for prolonged periods and the protozoa, helminth eggs, etc., remain intact. For the microscopic examination of the sample one drop of the formol faecal material and one drop of Lugol " double " solution (iodine 1 gm., potassium iodide 2 gm., distilled water 50 ml.), are mixed on a slide: one drop of a 1 per cent. watery solution of eosin is then added.

The percentage positive findings in the faecal samples examined in the Province were: *Giardia intestinalis* 15; *Entamoeba coli* 11; *Entamoeba histolytica* 10; *Ancylostoma duodenale* (eggs) 1·6; *Strongyloides stercoralis* 1; *Enterobius vermicularis* (eggs) 0·25; *Necator americanus* (eggs) 0·25; *Chilomastix mesnili* 0·25.

These results show a remarkable decline in the prevalence of hookworm infection during recent years which is indicative of noteworthy sanitary progress. *Norman White*

Vanni, V. & Margni, R. A. El catastro de las parasitosis intestinales de la República Argentina con el método de Vanni (Provincia de Corrientes). [**Investigations of Intestinal Parasitism in the Argentine Republic by Vanni's Method—Province of Corrientes**] *Rev. Inst. Malbrán.* Buenos Aires. 1950–53, v. 15, No. 4, 403–9.

Vanni's method for the collection and preservation of faecal samples was described in the previous paper [see Vanni and Ferreira above]. The method was used in a study of intestinal parasitism in the Province of Corrientes, the results of which are set out in this paper. [There appears to have been a slight modification in the method: each tube sent to the laboratory contains one part of faecal material to two parts of the 5 per cent. formol solution.] The method saves time and money: it is not necessary for the laboratory workers in charge of the enquiry to work in the area under investigation.

Half the population examined harboured one or other intestinal parasite: the percentage distribution of parasites was:— *Entamoeba coli* 13·6; *Necator americanus* and *Ancylostoma duodenale* 12·6; *Entamoeba histolytica* 7·0; *Giardia intestinalis* 6·2; *Strongyloides stercoralis* 3·6; *Hymenolepis nana* 3·0; *Endolimax nana* 1·8; *Iodamoeba bütschlii* 1·2; *Trichuris trichiura* 0·6; *Ascaris lumbricoides* 0·2; *Taenia saginata* 0·2.

A previous enquiry carried out by Fülleborn and colleagues [this *Bulletin*, 1935, v. 32, 637] had shown the hookworm infection rate to be 98 per cent. in rural areas and only slightly less in urban areas of Corrientes. There has been marked sanitary improvement during the last two decades in that Province. *Norman White*

Kessel, J. F., Parrish, Margaret & Parrish, G. **Intestinal Protozoa, Helminths and Bacteria in Tahiti, French Oceania.** *Amer. J. Trop. Med. & Hyg.* 1954, May, v. 3, No. 3, 440–46. [13 refs.]

Those selected for this survey in Tahiti fell into three groups:—(a) 300 presumably healthy subjects from schools and homes in the districts of Papara and Mataiea; (b) 200 persons from the French Colonial Hospital in Papeete, not exhibiting gastro-intestinal symptoms; (c) 60 clinic and hospital patients with acute gastro-intestinal symptoms.

Fifty persons were examined in each age group for intestinal protozoa, helminths and bacteria. *Entamoeba histolytica* was found in 22·3 per cent.; *Giardia* in 10 per cent.; *Balantidium* and *Isospora* in 0·4 per cent.; *Trichuris* in 44; hookworms in 38; *Enterobius* in 2·7; *Strongyloides* in 1·3; *Hymenolepis* in 0·2; and *Opisthorchis* in 0·2 per cent. *Shigella* and *Salmonella* were found in 3·9 and 0·9 per cent.

Higher percentages were detected for amoebic cysts by zinc sulphate flotation procedure than by either the direct film or that stained with iron haematoxylin. The exceptions were for *E. histolytica* in the films stained by the last-named method, and for *Iodamoeba* in which this method yielded a higher percentage than the zinc sulphate flotation procedure.

The complement-fixation test for amoebiasis was performed on 25 sera from persons harbouring *E. histolytica*. Eighty-four per cent. (21 sera) gave positive results. Five from those whose stools were negative were also negative by complement-fixation.

[Considering the rather confusing and contradictory statements on the practical value of this test it is disappointing that such a small series was employed.]

Results are shown in 6 tables. *Philip Manson-Bahr*

Galliard, H., Lapierre, J. & Larivière, M. Réponse du cortex surrénal à l'A.C.T.H. au cours de certaines affections expérimentales à protistes sanguicoles. [**Response to Corticotrophin of the Adrenal Cortex during Experimental Infections with Blood Protista**] *Ann. Parasit. Humaine et Comparée.* 1954, v. 29, Nos. 1/2, 5–11, 2 figs.

Plasmodium berghei, *Trypanosoma brucei* and *Toxoplasma* all produce a progressive fall in the eosinophiles of rats and mice; the interpretation of the Thorn test may therefore be rather difficult. Nevertheless, the test was carried out during various stages of these infections and the following results were obtained:—In mice infected with *P. berghei*, injections of corticotrophin failed to reduce the eosinophiles when the parasitaemia reached 25 per cent., or by about the sixth day of the disease. Rats and mice infected with *T. brucei* gave the negative reaction when the parasitaemia was sufficiently high—as early as the third day with rats and the ninth with mice; if the infection was cured with Bayer 205, the reaction remained negative for at least 34 days, showing that the function of the adrenals was affected for this period. Later, the reaction returned to normal and the animals were in good health. In the case of animals

infected with *T. gambiense*, *T. cruzi*, *Treponema duttoni* and *Toxoplasma*, injection of corticotrophin usually gave the normal reaction.

P. C. C. Garnham

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Hocking, B. **The Intrinsic Range and Speed of Flight of Insects.** *Trans. Roy. Entom. Soc. of London.* 1953, Oct. 23, v. 104, Pt. 8, 223–345, 29 text figs. & 14 figs. on 6 pls. [Numerous refs.]

Transmission of infection by biting flies is dependent, partly at least, upon their flight range. Working mostly in Northern Manitoba, Canada, on 10 biting insects (Tabanidae, Culicidae and Simuliidae) Hocking has estimated their maximum flight range, varying from 112 miles for *Simulium venustum* to 22 miles for *Aëdes communis*, and has suggested human population densities ranging from 1 in 320 square miles to 1 in 12 square miles, at which these insects respectively might become potentially significant in disease transmission.

The paper contains much information relating to the flight of insects and although by no means confined to those of medical importance the flies studied were:—Tabanidae: *Tabanus (Hybomitra) affinis*; *Tabanus (Hybomitra) septentrionalis*; *Chrysops furcata*; *Chrysops nigripes*; Culicidae: *Aëdes campestris*; *Aëdes communis*; *Aëdes nearcticus*; *Aëdes punctor*; Simuliidae: *Simulium venustum*; *Simulium vittatum*.

The general argument is that by assessing the energy available to an insect, the power required for insect flight and the efficiency of this flight, an estimation can be made of the intrinsic physiological range of flight in still air without a feed.

In assessing the energy available, experimental work included histological examination for fat and glycogen, estimation of crop capacity and nectar concentration. Field observations were made on the swarming of *Aëdes punctor*, *Simulium venustum* and *S. vittatum*; these were characterized by abdomens swollen with nectar and a disinterest in blood meals. These swarms may represent the beginnings of migrations. Observations were made on flower visiting by biting flies, and supply and demand of nectar in the subarctic: it was shown that the peaks of nectar production on tundra and in forest are synchronous with the peaks of flight of female tundra and forest species of mosquito respectively. The aerodynamical information needed was obtained in many ways. Direct measurement of mounted wings gave wing areas. Living insects attached by the thorax were used to give kymographic tracings of wing beat amplitude and speed or were placed in a wind tunnel or a flight mill to allow the measurement of such factors as drag, efficiency, flight range, flight speed and mass of air passing through the wings.

Incidental observations were made on flight behaviour.

Maximum flight endurance was calculated to vary from 7 to 35 hours for the different species studied. Hocking writes: "It is clear . . . that the contribution which wind may make to the dispersion of insects is potentially greater than that which insects may make by their own efforts in flight".

The paper includes summaries of published information on flower visiting by biting flies, and flight range of insect species related to those studied.

M. C. Williams

Allen, W. R. & Richards, A. G. **Oxygen Uptake of Muscle Homogenates from Three Species of Insects, in the Presence of Added Succinate, Cytochrome *c*, and Phosphate.** *Canadian J. Zool.* 1954, Feb., v. 32, No. 1, 1–8, 5 figs. [19 refs.]

The authors describe the oxidation of sodium succinate by muscle homogenates prepared from the leg muscles of adult cockroaches, *Periplaneta americana* and from thoracic muscles of adult beetles, *Tenebrio molitor*, and adult flies, *Sarcophaga bullata*.

Oxygen consumption at 30°C. was measured in standard Warburg flasks. The conditions required for optimum activity were first established for each species by using the assay method found satisfactory for vertebrate tissues, *i.e.*, concentrations of tissue, substrate, cytochrome *c*, phosphate buffer and hydrogen ions were varied systematically. In contrast to vertebrate tissue preparations, calcium and aluminium ions did not activate the systems present in muscle of *P. americana* or *T. molitor*, when phosphate concentration was optimal.

Activity was highest in muscles of *T. molitor*, intermediate in *S. bullata* and in males of *P. americana*, and lowest in females of *P. americana*. A significant three- to four-fold difference in activity between the sexes of *P. americana* was observed, but no differences associated with sex were recorded in the other species.

Significant differences relating to age were not observed in *P. americana* or *T. molitor*, but activity in *S. bullata* increased from a low level 3 days after emergence to a peak 5 days later. This was associated with the development of the thoracic muscle where a three- to four-fold increase in weight took place in the first 5 days after emergence. *J. S. Harington*

Bettini, S. & Boccacci, M. Localizzazione e distribuzione della succinodeidrogenasi nel muscolo di insetti. [**Localization and Distribution of Succino-Dehydrogenase in the Muscles of Insects**] *Rendiconti Istituto Superiore di Sanità*. Rome. 1954, v. 17, Pt. 3, 188–91, 1 fig. on pl. English summary (8 lines).

The authors, through the use of triphenyl tetrazolium chloride, commonly known as tetrazolium salt or TTC, have localized the enzyme succinic dehydrogenase in muscles of 3 species of insects: *Periplaneta americana*, *Gryllus bimaculatus* and *Musca domestica*.

Succinic dehydrogenase plays a vital rôle in respiratory processes of most living cells, and forms a link in the chain of reactions concerned with the oxidation of lipids, carbohydrates and proteins. The colourless solution of triphenyl tetrazolium chloride in the presence of the enzyme forms the insoluble and granular pigment, triphenyl formazan, whose red colour is clearly visible in tissue sections. Tetrazolium salt is therefore a useful substance for such histochemical determinations.

The authors found that in the presence of a specific substrate, triphenyl tetrazolium chloride produces in muscular tissue, in 3 minutes, a diffuse pink coloration which increases in intensity over a period of 30 minutes. The precipitation of red granules of formazan seen in the muscles of insects is analagous to that found by other authors in vertebrate tissues.

The time of appearance of the pink and, later, red precipitates in the

tissues was used as the index of activity of succinic dehydrogenase, and it was found that the activity of this enzyme, in the tissues studied, varied noticeably in the different species, and also in different sets of muscles in the same insect.

It was also shown that enzyme activity varied according to the kinetic activity of the muscles and also to the degree of pigmentation.

Experiments demonstrated that the activity of succinic dehydrogenase in muscles of *P. americana* was not inhibited by iodoacetic acid, either *in vivo*, or *in vitro*. Adult cockroaches were inoculated with sodium iodoacetate, and after 60 minutes, when paralysis set in, the muscles were examined by the use of the histochemical colour reaction previously described. Determinations were also made before and after inoculation, when paralysis was complete, and immediately after the death of the insect. In no cases was any inhibition of succinic dehydrogenase observed, a finding which accords with results of similar determinations in vertebrate tissues.

J. S. Harington

Keener, G. G., Jr. & Larsen, W. E. **A Technique to facilitate Identification of Mosquitoes in Light Trap Collections.** *Mosquito News.* 1954, June, v. 14, No. 2, 66–7, 2 figs.

Burton, G. J. **Rapid Permanent Mounts of Mosquito Larvae with Creosote-Alcohol, Phenol-Alcohol, Lactophenol and Polyvinyl Alcohol.** *Mosquito News.* 1954, June, v. 14, No. 2, 72–5.

Vermeil, C. De la reproduction par autogénèse chez *Aedes (O.) detritus* Haliday. [**Autogenous Reproduction in** *Aëdes detritus*] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 971–3.

The author has shown by experiment that females of *Aëdes detritus* are able to lay eggs having had nothing but water to feed on. Moreover, 3 generations were produced though the culture then died out because many eggs failed to hatch.

Reasons for the extinction of the colony are suggested and it is hoped to resolve the problem in later studies. *H. S. Leeson*

Edmunds, L. R. & Keener, G. G., Jr. **Observations on the Biting Habits of *Culicoides crepuscularis* Malloch in Western Nebraska, with Notes on other Species collected in Light Traps (Diptera, Heleidae).** *Mosquito News.* 1954, June, v. 14, No. 2, 82–3.

Edmunds, L. R. **A Note on Irrigation Drop Structures as Breeding Sites of Blackflies in Western Nebraska (Diptera: Simuliidae).** *Mosquito News.* 1954, June, v. 14, No. 2, 65–6, 1 fig.

Schoof, H. F., Mail, G. A. & Savage, E. P. **Fly Production Sources in Urban Communities.** *J. Econom. Entom.* 1954, Apr., v. 47, No. 2, 245–53, 7 figs.

This paper records the results of surveys of fly breeding sites in Charleston, W. Virginia, in Phoenix, Arizona, and in Topeka, Kansas, during 1950 and 1951. These towns were divided into blocks, characterized as high, middle or low-classed residential, or as business areas. The breeding materials were classified as (i) garbage (scattered or in containers), (ii)

excrement (various types), and (iii) miscellaneous (meat, carcasses, coffee grounds, grass clippings, etc.). The larvae collected from 769 samples were identified, either by rearing them to adults or from a larva " key ".

The degree of fly breeding in garbage and miscellaneous substances showed a distinct increase with a decline in the socio-economic status of the residential areas. This difference was not so clearly seen in regard to breeding in excrement. The fly breeding in business premises was intermediate in garbage, etc., but low for excrement.

In all of the 3 towns surveyed, the most prolific breeding source of flies was garbage, which amounted to 40 to 50 per cent. of all infested sites. Excrement (largely dog and fowl) accounted for 24–29 per cent. of breeding at Charleston, 36 per cent. at Phoenix and 46 per cent. at Topeka. In the last two towns, horses and cattle produced appreciable sources.

An analysis of the fly species in different breeding materials showed house-flies the most common type, with the widest range of choice. Next in importance were various blowflies, especially *Lucilia* spp. and *Sarcophaga* spp.

The house-fly tended to be most common in scattered garbage whereas the *Lucilia* blowflies preferred the garbage in containers. The dog excrement in all towns was most commonly infested with *Sarcophaga* (over 90 per cent. of the larvae) whereas the chicken dung was more infested with *M. domestica* (60 to 80 per cent.).

It was concluded that a thorough knowledge of the breeding habits of various flies could assist control measures. For example, insecticides could be usefully employed on carcasses, grass clippings and fish waste, since *Musca domestica* seldom occurred in such materials, and other species of fly have not shown insecticide-resistance. *J. R. Busvine*

D'Alessandro, G. & Mariani, M. Osservazioni sulla eredità dei caratteri " resistenza " e " sensibilità " al DDT in *Musca domestica* L. [**The Inheritance of Resistance and Sensitivity to DDT in** *Musca domestica*] *Riv. di Parassit.* Rome. 1954, Apr., v. 15, No. 2, 85–94, 3 graphs. English summary (7 lines).

Previous investigations of the genetics of DDT-resistance in house-flies have given different results, according to whether mortality from topical applications or speed of paralysis by DDT was used as the criterion of resistance. The first method gave results suggesting multiple factor inheritance [Bruce and Decker, *Bulletin of Hygiene*, 1950, v. 25, 825] and the second technique suggested single-gene inheritance, with resistance recessive [Harrison, this *Bulletin*, 1951, v. 48, 930]. The present authors have done reciprocal crossing experiments between a susceptible strain of house-fly and one reared for 40 generations in cages treated with 3 gm./m² DDT, and therefore highly resistant. The degree of resistance was measured by time before paralysis, in a DDT-treated glass chamber; but the criterion was a late non-reversible stage of paralysis, equivalent to final mortality. The F_1 generation of both crosses was intermediate in resistance between the parents, though perhaps nearer the susceptible type. The F_2 generation showed a long spread of resistance from completely susceptible to very resistant. The progeny of highly resistant couples of the F_2 generation were found to include some susceptible flies in the F_3 generation. Similarly, eggs obtained from F_2 couples, later shown to be susceptible, were reared to adults, and these included some resistant flies. Therefore, neither extreme of the F_2 series was genetically pure.

These results are inconsistent with a single-gene theory of DDT resistance,

which character appears to be due to multiple genes. These genes seem to be dominant or recessive according to unknown circumstances and this makes it difficult to select a pure strain of either resistant or susceptible flies. *J. R. Busvine*

Gahan, J. B., Wilson, H. G. & McDuffie, W. C. **Organic Phosphorus Compounds as Toxicants in House Fly Baits.** *J. Econom. Entom.* 1954, Apr., v. 47, No. 2, 335–40.

A previous paper by Gahan *et al.* [this *Bulletin*, 1954, v. 51, 851] showed the value of various baits for controlling resistant house-flies in dairy barns. This paper records further tests of the newer, safer phosphorus insecticides, malathion, Diazinon [Gasser, this *Bulletin*, 1954, v. 51, 746] and Bayer L 13/59 (a dialkyl phosphonate). Preliminary laboratory tests showed that all three were highly toxic to flies in molasses baits, especially the last two mentioned. Malathion was inclined to be repellent to flies at the higher concentrations.

Further tests were done in dairy barns heavily infested with house-flies. The baits were applied with a garden-type sprinkling can to the daytime feeding places of the flies. Usually the bait was sprinkled on concrete floors, but in one barn with dirt floors, pieces of galvanized metal were placed between the pens and treated. From 1 to 3 gallons of bait were used for each treatment in each barn, 5 days a week, for 3–5 weeks. The abundance of house-flies was determined by counting the numbers which settled on cloth covering dishes containing malt and water. The results showed that single applications of baits containing 0·1 per cent. of malathion, Diazinon or L 13 59 plus 10 per cent. molasses each gave excellent fly control (over 90 per cent.); but frequent treatments were required to maintain a high degree of control. Also, lower concentrations of attractant (molasses or sugar) decreased the effectiveness of the baits. Nevertheless the treatment could be recommended for control of flies in refuse dumps where other insecticides are ineffective because of resistance.
J. R. Busvine

Bechtel, R. C. & Grigarick, A. A. **A Method for the Evaluation and Retreatment of Insecticide-Treated Cotton Strings used for House Fly Control.** *J. Econom. Entom.* 1954, Apr., v. 47, No. 2, 369–70.

Three-foot lengths of cotton string, previously soaked in insecticide and sugar solution, were suspended above 9-inch cardboard trays, in a fly-infested barn. At intervals of 3 days, dead flies were collected from the trays. The insecticides used were malathion at 5 and 50 per cent. and Diazinon at 5 and 25 per cent.; in both cases the lower concentration was quite as effective as the higher. In the trays under the treated strings, some 800 to 1,500 flies collected over 36 days, compared to 40–80 in control trays. The strings could readily be re-treated by a long thin cylinder filled with solution in which they could be immersed without disturbance. Ten per cent. sugar was added to most of the solutions tested. It did not improve the performance of the Diazinon treatment, but it made the string stiff on drying and therefore easier to immerse during re-treatment.
J. R. Busvine

Vermeil, C. Deux cas tunisiens de myiase oculo-nasale humaine due à *Oestrus ovis*. [**Two Cases of Ocular-Nasal Myiasis due to** *Oestrus ovis* **in Tunisia**] *Ann. Parasit. Humaine et Comparée.* 1954, v. 29, No. 3, 324–5.

Hurd, P. D., Jr. **" Myiasis " resulting from the Use of the Aspirator Method in the Collection of Insects.** *Science.* 1954, June 4, v. 119, 814–15.

For two summers the author was working as entomologist in an Arctic Research Laboratory in Alaska. Since the insect fauna is composed largely of small insects such as gnats, midges, anthomyid flies, rove beetles, Collembola and wasps parasitic on the flies, he mainly used the aspirator method of collecting. In this commonly used apparatus the insects are drawn into a tube leading to a glass vial, by means of an air current produced by the operator sucking air from another tube attached to the vial. The insects are prevented from entering the second tube by means of a grid, in this case a " fine mesh brass screen ". About two months after the end of the work the author became ill and, during the subsequent week, a variety of small insects were passed alive from the left antrum of the sinus. These included 3 adult staphylinid beetles of the species *Micralymna brevilingue*, 13 fungus gnat larvae (*Boletina birulai*, Mycetophilidae), 3 egg parasitic wasps (*Mymar* sp., Mymaridae); and about 50 Collembola (*Isotoma olivacea*).

The author admits that it is almost unbelievable that all these insects should have passed through complete development in his antrum, but states that since the wire screen was so fine as to preclude passage of adult insects, it has to be concluded that such must be the case. [The development in a human nasal cavity of insects, parasitic on other species, seems inconceivable. Possibly the adult insects were inhaled directly in normal breathing.]

J. R. Busvine

Grayson, J. McD. **Differences between a Resistant and a Non-Resistant Strain of the German Cockroach.** *J. Econom. Entom.* 1954, Apr., v. 47, No. 2, 253–6, 3 figs.

Comparative data are given for the toxicities to these strains of chlordane, lindane and TEPP.

Smith, C. N., Cole, M. M., Gilbert, I. H. & Gouck, H. K. **Field Tests with Tick Repellents—1949, 1950, and 1952.** *J. Econom. Entom.* 1954, Feb., v. 47, No. 1, 13–19.

Studies on the effectiveness of various tick repellents were carried out by the authors during the summers of 1949, 1950 and 1952 in South Carolina and Georgia. The materials were used either as individual compounds or as mixtures and were applied as emulsions or solutions to regulation two-piece army fatigue uniforms of cotton twill; a few treatments were made with sprays and aerosols also. Subjects wearing the treated uniforms were exposed in places infested with nymphs and adults of *Amblyomma americanum* for 1 or 2 hours. The effectiveness of the chemical was determined on the basis of the number of attached ticks and also on the total number.

Forty-four individual compounds were tested for repellency either as acetone solutions or as emulsions. Of these, *N*-propylacetanilide, *N*-butylacetanilide and 1-benzylcyclohexanol gave average repellencies of 97 to 98 per cent. both as solutions and emulsions; however, the last compound was dropped from further tests as it was found to be very irritating to the skin.

Compounds that were very effective as tick repellents were combined with outstanding repellents against mosquitoes, fleas and chiggers, to develop a general-purpose mixture which would be effective against all the species. The most effective of these mixtures was one containing *N*-butylacetanilide as the tick repellent.

M. G. R. Varma

Audy, J. R. & Harrison, J. L. **Field Tests of Repellent M-1960 against Leeches.** *Med. J. Malaya.* 1954, Mar., v. 8, No. 3, 240–50.

"M-1960" is a mixture of repellents used to impregnate U.S. army uniforms to repel various biting arthropods. An earlier communication [this *Bulletin*, 1952, v. 49, 1006] described some observations on the effectiveness of this treatment in preventing leech bites. This paper describes further, more extensive tests, also done in North Borneo, against water leeches (*Hirudinaria manillensis*) and land leeches (*Haemadipsa zeylanica* and *H. picta*). [The authors use the spelling *Hirundinaria* which appears to be a *nomen nudum*. The genus *Hirudinaria* Whitman, 1886, however, itself appears to be preoccupied by *Hirudinaria* Scacchi, 1833 (*Oss. Zool.* p. 9). The nomenclature evidently requires clarification.]

Parties of native villagers, with or without treated clothing, exposed themselves by wading in infested water or by working in infested jungle. At intervals they were examined for leeches and for bites. The tests showed that the mechanical effect of even untreated clothing was considerable; for example, good protection was afforded by trousers tucked into socks.

Most of the tests were therefore done with trousers slightly rolled up. The experiments confirmed the earlier observations on the protective value of the treatment, which was observed to have a lethal effect on the leeches and killed any trapped in impregnated clothing. The protection was particularly good for land leeches, which often have to travel across clothing before reaching the skin. A measurable and useful degree of protection against land leeches remained after impregnated clothing had been washed 6 times with soap and cold water.

[As mentioned in the earlier paper, "M-1960" consists of equal parts of *n*-butylacetanilide; 2-butyl,2-ethyl-1,3-propanediol; and benzyl benzoate, with 10 per cent. of an emulsifier. 1 U.S. gallon (0·8 Imperial gall.) will treat 28 uniforms by hand or 13 if a portable laundry unit is used.]

J. R. Busvine

Curtis, L. C. **A Portable Pneumatic Spray Unit.** *Mosquito News.* 1954, June, v. 14, No. 2, 58–61, 5 figs.

"A portable, back-pack mist sprayer for control of adult biting-flies is described. The unit is power-driven, holds two imperial gallons of insecticide, and has an output of 15·75 to 18·75 gal. per hour. It is designed especially for use in areas where roads and trails are lacking, and weighs about 58 lb. when fully loaded with fuel and insecticide."

Bollen, W. B., Morrison, H. E. & Crowell, H. H. **Effect of Field Treatments of Insecticides on Numbers of Bacteria, *Streptomyces*, and Molds in the Soil.** *J. Econom. Entom.* 1954, Apr., v. 47, No. 2, 302–6.

Bollen, W. B., Morrison, H. E. & Crowell, H. H. **Effect of Field and Laboratory Treatments with BHC and DDT on Nitrogen Transformations and Soil Respiration.** *J. Econom. Entom.* 1954, Apr., v. 47, No. 2, 307–12.

MISCELLANEOUS PAPERS

Beaglehole, E. **Cultural Factors in Economic and Social Change.** *Internat. Labour Rev.* 1954, May, v. 69, No. 5, 415–32. [Refs. in footnotes.]

Medical men, and others interested in the social services, sometimes feel a sense of frustration when they see their advice for betterment received with only modest enthusiasm by people to whom (it would be thought) this advice would be particularly helpful. The advantages of good water supply and cleanly habits, and of scientific methods of farming and animal husbandry, should make an immediate and lasting appeal which, one would think, must ensure willing acceptance and cooperation by the people. But, of course, if the cause of disease is not to be found in environmental factors such as micro-organisms, bad feeding habits, and so on, but is essentially related to magic and evil spirits, this insistence on cleanliness may have some aesthetic value, but does not touch the heart of the problem; and if the new practices which we so earnestly try to introduce do not conform to established custom, they can hardly survive in a useful form.

The author of this paper gives many instances of the inherent difficulty of attempting to improve health conditions in ignorance of local concepts of illness, and emphasizes the importance of anthropological study in the public health services of under-developed countries. He makes the important point that "technological change cannot 'sell' itself by its utility alone", which should be remembered in all branches of such work. The paper should be carefully studied.

[See also Adams, this *Bulletin*, 1952, v. 49, 915.] *Charles Wilcocks*

REPORTS AND SURVEYS

Food and Agriculture Organization of the United Nations. **FAO Nutrition Meetings Report Series No. 6. Report of the Nutrition Committee for South and East Asia. Third Meeting.** Bandung, Indonesia, 23–30 June 1953. pp. iii + 38. Rome: 1954, Apr. [$0.40; 2s.]

The FAO Nutrition Committee for South-East Asia met for the first time in the Philippines in 1948. The report of that meeting is a most important document for it sets out succinctly the problems before nutritionists in the Far East and indicates lines of solution. The second meeting was held in Rangoon in 1950. Its report is a valuable supplement to the first. The third meeting was held in Bandung, Indonesia, in 1953. This report adds little of scientific importance to the previous two. Indeed very few of the important nutritional scientists attended the meeting. For instance, only one of the many distinguished nutritionists in India was present. The Philippines also sent only one delegate. Clearly the intervals between the meetings are too brief to persuade governments to send leading scientists on each occasion. The Bandung meeting, if scientifically unimportant, may have been an invaluable educational occasion. One-third of the forty delegates were Indonesians, mostly officials. They would have had the opportunity to hear a clear statement about the problems of rice milling, and the effects of enrichment, parboiling, washing and cooking on the nutritive value of rice. The importance of protein malnutrition in the health of mother and infants was discussed and the importance of

kwashiorkor as a disease in the East. Calcium and vitamin A deficiency were also reviewed and a report of a study group on endemic goitre was available. The committee spent much of its time in considering education in nutrition and the training of the necessary teachers. All this is none the less important for not being new.

The reader will find in this report a brief but clear summary of the problems which are attracting the attention of nutrition workers in South-East Asia to-day. *R. Passmore*

East Africa High Commission. **Virus Research Institute, Entebbe. Annual Report No. 4, 1953** [Haddow, A. J., Director]. 23 pp., 4 figs. on 4 pls. 1954. Nairobi: Govt. Printer.

The 4th Annual Report of the Virus Research Institute, Entebbe, describes the work done during 1953. Yellow fever protection tests were made on 406 human sera collected from the Anglo-Egyptian Sudan, and 80 of these were positive. Since the age distribution clearly indicated recent infection an attempt will be made to demonstrate virus reservoirs, particularly among bush-babies in the neighbourhood. Similar protection tests were also made on human sera from Tanganyika; 8 of 278 were positive. The examination of sera from 6 species of Primate from the same district suggested that *Galago crassicaudatus* was involved in the yellow fever cycles in the area.

Some interesting laboratory experiments with *Liparyssus galagus* are described. This mite is one of the commonest ectoparasites on the bush-baby *Galago senegalensis*, and the experiments are designed to establish the rôle of this mite in maintaining yellow fever infection among bush-babies.

A detailed investigation is reported of an epidemic of a dengue-like infection which first occurred in Tanganyika in 1952. The disease was called locally *chikungunya* and appeared to be quite new to the district. Virus was isolated from patients and from mosquitoes: *Aëdes aegypti* seemed to be the main vector, so far as man was concerned. The virus strains, isolated by inoculation into baby mice, proved surprisingly easy to recover, and in this they differed from the dengue strains. The strains isolated were of two types, designated Chikungunya A and B. The B strains showed some serological relationship to other strains of dengue virus, but the A strains are not at present identified with any other known virus. Some transmission experiments are described.

Antibodies for West Nile virus have been found in the blood of a number of cattle in the Karamoja district. Attempts were made by direct inoculation of this virus into cattle to discover whether the virus could give rise to a fatal disease in this species: two such experiments were negative.

A brief account is given of the sophisticated studies on influenza virus which were announced in last year's Report [this *Bulletin*, 1954, v. 51, 238]. The study has been mainly concerned with the differences, previously noticed, between the first cycle of infection in cells of the chick allantoic cavity and the subsequent cycles. Work is also reported on the spread of infection of influenza virus, when spread is confined to contiguous cells. [The new method described for obtaining receptor destroying enzyme from *Vibrio cholerae* should be treated with reserve until the importance of the particular batch of proteose peptone used has been more clearly defined.]

The relation between Rift Valley Fever virus and *Aëdes aegypti* is another study which was announced in last year's Report. However, the

preliminary work has proved more difficult than was expected, and there has not been anything very tangible to add to last year's intentions.

A new apparatus for feeding mosquitoes on infected material is described and illustrated. The principle is that the mosquito is induced to feed through a bat-wing membrane.

The Report concludes with the description of preliminary experiments with tissue culture technique and with mouse ascitic tumours; it is probable that these techniques will find increasing application in future work of the Institute. There is a bibliography of 8 papers published or submitted for publication during the year. *Forrest Fulton*

East Africa High Commission. **East African Tsetse and Trypanosomiasis Research and Reclamation Organization. Annual Report 1953** [Lewis, E. A., Director]. 66 pp., 2 figs. on 2 pls. & 1 folding plan. [14 refs.] [1954.] Nairobi.

In his introduction the Director announces that the tsetse research centre at Shinyanga hitherto known as the Tsetse Research Department or Division has been renamed the Central Tsetse Research Laboratory and the trypanosomiasis research centre at Sukulu is now the Central Trypanosomiasis Research Laboratory. After noting that the staff position improved towards the end of the year he then describes the functions of the EATTRRO and summarizes the other sections of the report.

Writing on tsetse research Dr. C. H. N. Jackson indicates that the objects now are to press on with laboratory work and to study tsetse belts farther afield especially the great eastern belt of Tanganyika which contains *Glossina pallidipes*, *G. austeni* and *G. brevipalpis* as well as *G. morsitans orientalis*, and the forested country near Jinja, north of Lake Victoria, which contains *G. pallidipes* and *G. palpalis*.

Details of the routine work are then given and accounts of the increases and decreases in density of various species. For example, regeneration of woody growth has advanced in the neighbourhood of Chibe kopje and there was a danger of the re-invasion of much of the rest of Western Shinyanga by *G. swynnertoni*, but prompt measures were taken to prevent this. Another danger from *G. pallidipes* was much diminished by settlement, and general settlement also seems to be the answer to the *G. morsitans* position in Kahama. Population studies of *G. pallidipes* in the Ruma thicket of the Lambwe valley continued until July and were then switched to Sikiri. Fly marking and constant traversing of the spiral paths did not unduly disturb either flies or animals. The highest birth-immigration rate was in the cool dry season (July and August) and the highest death-emigration rate was in the two dry seasons, perhaps because death is high in the hot season (about March) and emigration in the cool one.

Other interesting points from this section are that a new distributional record was established for *G. pallidipes* at Butambara, Kahama District; that such progress has been made in the identification of the hosts of tsetse flies by tests on their blood meals that Mr. B. Weitz of the Lister Institute was able to say that antelope blood was gazelle and not impala, duiker or reedbuck; and Dr. E. Burtt has discovered that high humidity during pupal life produces intense blackening of the abdominal bands of *G. pallidipes*. He also demonstrated that the larvae of *G. swynnertoni* can remain active for 1½ hours (commonly ¾ hour) before pupating on a hard surface, and the larva of *G. pallidipes* can defer pupation for as long as 3 hours. It seems also that *G. swynnertoni* feeds oftener than *G. morsitans*, which may

explain its survival in arid and relatively shadeless country. Finds of pupae of *G. swynnertoni* have been recorded up to 20 feet above ground level.

Dr. M. A. Soltys reports on trypanosomiasis research. It was shown that cattle in an endemic area infested with *G. austeni* acquired resistance to trypanosomes by receiving antrycide chloride sulphate mixture every second month while untreated animals contracted trypanosomiasis. An experiment was started to prove that biting insects other than tsetse flies can transmit trypanosomes. An area near Mbarara, Uganda, was selected because of its freedom from tsetse flies and from native cattle, as well as for its adequate water supply and grazing. A survey before and during the experiment showed the presence of *Musca*, *Stomoxys*, *Haematopota*, some *Tabanus*, and mosquitoes, midges, fleas and ticks. The experiment ran for 13 months and no animals in the control group were infected during the whole period but others became infected in periods varying between 14 and 183 days.

Other studies include the demonstration of a trypanocidal substance in the organs of dead animals and the testing of preserving media for trypanosomes. The effect of a milk diet on trypanosomes was negative; all the experimental rats died in the same period of time [see also this *Bulletin*, 1954, v. 51, 33]. It was also shown that trypanosomes prefer an alkaline medium rather than an acid one.

At Tinde, 4 South African strains of polymorphic trypanosomes were tested for infectivity to man. The need for these tests arose from the accidental infection of a laboratory worker apparently by a strain assumed to be *Trypanosoma brucei*. Experiments revealed that the strains received contained *T. rhodesiense* as well as *T. brucei*. It is hoped to publish a full account in the near future. Meanwhile it is of interest to note that the successful transmission of blood forms of *T. rhodesiense* requires the inoculation of more than 20,000 trypanosomes to produce a reaction and infection in man, while 300 to 400 metacyclic forms of the same trypanosome from the bite of a tsetse will usually suffice. In contrast, trypanosomiasis can be transmitted to cattle with as low a number as 100 blood forms of *T. congolense*.

The Tinde strain of *T. rhodesiense* has not lost its infectivity to man after 18½ years and *T. brucei* still shows no sign of reaction or infection to man.

Sleeping sickness in Tanganyika is attributable mainly to *T. rhodesiense* in areas infested with *G. morsitans*; in Kenya mainly to *T. gambiense* in the *G. palpalis* area of the Nyanza Province and in Uganda, especially in the south east, to *T. rhodesiense* associated with *G. pallidipes* and to *T. gambiense* with *G. palpalis*.

The section on experimental reclamation is by Mr. J. Ford, who reports that discriminative clearing achieved its main object of eliminating the influx of *G. morsitans* into Tabora township though an unexpected increase in tsetse density had to be dealt with. This occurrence prompts the thought that one of the gaps in our knowledge is ignorance of the minimum density at which a tsetse population can continue to exist.

The problems to be solved in the Masai Pilot Scheme in Kenya are listed and so are the 17 types of bush encountered with suggestions as to how they are to be treated.

In the Lambwe Valley, Kenya, the task of dealing with *G. pallidipes* is a formidable one. The central thicket of Ruma contains a population of tsetse far greater than any yet measured. A summary of work done since 1948 is abstracted from a review compiled by Mr. A. G. Robertson. An attempt to destroy or drive out game failed to work as did another scheme of clearing and settlement. It seemed that with some exceptions no method of dealing with *G. pallidipes* will succeed except sheer clearing all

thicket. This method is, however, often held up by the expense and by shortage of labour. Nevertheless some success has been achieved and the immigration of settlers has been accelerated.

A study of the use of defoliants and arboricides has commenced.

In the Mkata Pilot reclamation scheme, Tanganyika, good progress was made with clearing a mile-wide sheer barrier around the wet season grazing retreat. The Veterinary Department is building up a cattle population on *mbugas* surrounded by infested bush. It was later decided to deal with dense infestations of the Mkata river by *G. brevipalpis* by insecticides.

As part of the Ankole Pilot Scheme in Uganda it was decided to aim at the installation of 500 families. Although doubts were expressed as to the probable success of the scheme, it is encouraging to note that the efforts of the District Authorities are now meeting with success and 53 settlers are already installed.

A meeting between British and Belgian authorities resulted in agreement to survey the country surrounding the Ruanda-Urundi border. When all surveys are completed material will be available for a full discussion on a programme of reclamation.

The report contains an account of the work of the advisory services who have helped Bechuanaland, Zanzibar and other places.

This account of the East African campaign against the tsetse fly is an interesting document fully provided with tables showing the collected data, statements of costs in money, labour, distances covered, difficulties encountered and overcome, equipment used and experiments performed.

H. S. Leeson

Moçambique. Missão de combate às tripanossomíases. Relatório anual de 1952 [de Andrade Silva, M.A.]. [**Annual Report for 1952 of the Trypanosomiasis Commission**] 92 pp., 1 folding coloured map & 14 figs. on 10 pls. 1953. Lourenço Marques: Imprensa Nacional de Moçambique.

This report follows the form of its predecessors [see this *Bulletin*, 1949, v. 46, 984; 1951, v. 48, 339; 791; 1953, v. 50, 392; 1954, v. 51, 238]. An administrative section gives numbers of staff, details of equipment and costs, etc., which show the scale on which the organization works; then follow various sections which include one on surveys and others on sleeping sickness, animal trypanosomiasis and entomological activities.

The work of the survey section is briefly described under the various areas, and localities are given for the occurrence of *Glossina morsitans*, *G. pallidipes*, *G. brevipalpis* and *G. austeni*; some new foci of the last are recorded and it is noted that for its recognition, increasing reliance is being placed on the discovery of its puparia, since the fly itself is so difficult to encounter. A decrease in apparent density of *G. morsitans* is noted in two areas; in one this was connected with a diminution in the big game and in the other with destruction of vegetation following an extension of cotton growing.

No considerable change in the distribution of sleeping sickness is reported; 200 new cases are recorded, representing an index of infection of 0·45 per 1,000. The previous practice of treating patients in the earlier stages of the disease with antrypol or pentamidine isethionate has been continued with results considered satisfactory, 88 per cent. of clinical cures being recorded; later cases, in which the nervous system is involved, continue to be treated with one or other of the above drugs and tryparsamide, the combination of pentamidine and tryparsamide being considered a little the superior. Some preliminary essays in the use of Mel B in the form of

arsobal are referred to; these are reported to show this drug to be an excellent trypanocide but one which must be reserved for use in the treatment of in-patients in view of the toxic effects to which it sometimes gives rise.

Details are given of the incidence of trypanosomes in domestic animals; 12,466 of these were examined, showing an infection rate of a little over 4 per cent.; *Trypanosoma vivax* was the commonest parasite, *T. congolense* being only half as frequently observed; *T. brucei* was rare and no other species was reported during the year. A list of some 2,500 wild animals examined, including 27 different species, showed only 47 to have been infected with trypanosomes (*T. vivax* and *T. congolense*, singly or in combination). In the course of routine chemotherapy against nagana over 44,000 domestic animals were treated with dimidium bromide, and over 26,000 with antrycide. Just under 200 bovines were also treated experimentally with the meta-sulphate and the pro-salt of this drug, but as the observations are still in progress, no results could be given. Natural tolerance shown by small stock of the Maputo area to locally acquired trypanosomiasis is discussed.

The entomological activities are reported under the 3 subsections which have operated during the year. The first, in the Mutuali region, reports the progress of the campaign against *G. morsitans* by game destruction, in the course of which the total number of animals destroyed during the year was 1,731. This brings the total number of animals killed in this operation since 1946 to 12,891. Totals of the tsetse caught on fly rounds and in de-flying chambers are given; the 4,876 identified from the area were all *G. morsitans*, except for a few rare specimens of *G. pallidipes*; dissection of 1,467 flies showed 2·5 per cent. with proboscis infections, 2·4 per cent. with gut and proboscis infections, 1·3 per cent. with infections of the gut alone and 0·14 per cent. with infections of the gut, proboscis and salivary glands. Successful introduction of bovines into the reclaimed areas is reported.

The second subsection was concerned with a campaign against *G. austeni* in the region of Chinhanguanine by partial, discriminatory clearing of vegetation; the map at the end of the report shows the location of the operations, and the plates show the nature of the discriminatory clearing; all the shrub vegetation and some of the trees are being destroyed; 278 hectares were cleared between mid-August and the end of the year. In the course of the operations on the fly in this area observations were made on the resting habits of *G. brevipalpis* and *G. austeni*. A list of biting arthropods (ticks, tabanids and hippoboscids) identified by this subsection is given.

The third subsection was occupied in another campaign of game destruction against *G. morsitans* in the region of Govuro, in the course of which 4,600 animals were shot. The total number of animals killed in this operation since July 1949 is given as 15,196. The number of flies caught in the fly rounds and at the fly chambers is recorded; a fly round which had produced 11,462 flies in 1951 caught only 3,855 in 1952. Identification of nearly 14,000 tsetse showed all to be *G. morsitans*, except for one specimen of *G. austeni*. Plans are described for the reoccupation of the land freed from the tsetse, to start in September of the current year. A scheme is also outlined for an ecological survey in the Mozambique area, where all the 4 species of *Glossina* occurring in the territory are to be found. Details of a further 282 animals killed in the course of operations in the Changara area are given but with no information as to their object. Control operations against *G. pallidipes* in the Espungabera area, by means of partial discriminative clearing, are also referred to.

The records of flies caught at the de-flying chambers show most flies caught off vehicles, the number recorded being about twice as many as that

off bicycles, which is again over twice that caught off pedestrians, although the number of those is, as would be expected, considerably in excess of either of the transporting agents.

[The provision of much detailed information in the form of tables, as was noted for last year's report, is to be commended. It is, however, a matter for regret that the admirable charts which showed the effects of certain of the control operations on the fly numbers have not been again repeated; it would also add greatly to the value of the tables of game animals shot, the details of which are of interest, if the size of the area over which the shooting had taken place during the year could be given; information which provides even a rough idea of animal density in Africa is all too scarce.] *W. H. Potts*

Robinson, E. **Medical Aspects of the Domasi Development Area, Nyasaland.** *J. Trop. Med. & Hyg.* 1954, June, v. 57, No. 6, 131–7.

A carefully selected sample of about 8 per cent. of the 14,000 inhabitants of a development area coming from 20 per cent. of the villages were examined clinically and pathologically. The results are set out in a series of tables classified by age and sex and in some cases by degree of finding, but are here summarized as totals only :—

Schistosomiasis : miracidia in urine, 28·1 per cent. ; malaria : parasites present, 18·0 per cent. ; haemoglobin value : level 80 per cent. or less, 37·1 per cent. ; pellagra : skin manifestations present, 6·2 per cent. ; Kahn reaction, positive, 24·8 per cent. ; splenic enlargement, 28·1 per cent. ; liver enlargement, 9·2 per cent. ; leg ulcer, 2·0 per cent. ; loss of sight, blind in one or both eyes, 2·4 per cent. ; Mantoux positive, 65·4 per cent.

The significance of these findings is discussed; it is particularly noted that the prevalence of moderate anaemia is directly related to the prevalence of malaria in the groups concerned. *G. Macdonald*

BOOK REVIEWS

Simons, R. D. G. Ph. [Edited by.] **Handbook of Tropical Dermatology and Medical Mycology. Vol. II.** pp. xvi + 849–1705, figs. 588–1098. 1953. [With separate Appendix of xvi pp.] Amsterdam : Elsevier Publishing Co. London distributors : Cleaver-Hume Press Ltd., 31, Wright's Lane, W.8. [£5.]

The first volume of this work dealt mainly with the dermatoses due to protozoa, spirochaetes, bacteria and viruses [this *Bulletin*, 1953, v. 50, 362], and the present one is concerned with diseases due to animal parasites, fungi and malnutrition. Fifty-eight dermatologists have contributed to produce a volume of 851 pages with 509 illustrations.

The first section includes chapters on scabies, harara and tungiasis, dermatoses due to arthropods, schistosomal affections of the skin, filariasis and creeping disease. Identification of the commoner biting insects is simplified by the inclusion (page 909) of a particularly useful rogues' gallery.

The superficial and deep mycoses are the subject of the second section, which comprises 38 chapters occupying 400 pages. The terminology of the opening chapter is not entirely correct, and there is, inevitably, a good deal

of overlapping and some controversial material in the succeeding pages. *Candida albicans*, for example, is considered of little importance as a cause of disease, and primary onychomycosis is believed to be rare (page 1231). Chromoblastomycosis is included among the systemic mycoses and tinea capitis is unfortunately separated from the other ringworm infections.

The third section includes chapters on allergy, drug eruptions, the "id concept", malnutrition and porphyria. The remaining sections deal with skin tumours and such miscellaneous subjects as adenitis, ainhum, craw-craw and Brazilian pemphigus.

This is a well-produced book, illustrated by a large number of photographs, most of which are good. The two volumes represent the first attempt to produce a comprehensive textbook of tropical dermatology. They will be of value to the physician requiring a detailed work of reference on this subject, although a little elaborate to be useful to the general practitioner in an out-station.

H. T. H. Wilson

ROBERTS, Ffrangcon [M.A., M.D., F.F.R.]. **Medical Terms. Their Origin and Construction.** pp. viii + 88. 1954. London: William Heinemann Medical Books Ltd., 99, Great Russell Street, W.C.1. [6s.]

JAEGER, Edmund C. [D.Sc.]. **A Source-Book of Medical Terms.** Foreword by Irvine H. PAGE, M.D. Illustrations by Lloyd Mason SMITH and the author. pp. xxiii + 145, numerous figs. 1953. Springfield: Charles C. Thomas, Bannerstone House, 301–327 East Lawrence Avenue, Illinois. [40s.]

[This review appeared also in the *Bulletin of Hygiene*, 1954, v. 29, Dec.]

These two books are complementary and together form a most useful introduction to the philological background of medicine.

The first explains systematically the meaning of medical terms and shows that they contain much of the history of medical thought.

Part I deals with the origin of the older terms in general use and also shows how the meaning of complex modern words can be understood by following a few simple rules. Part II tabulates words and their associated ideas, according to colour, textures, movement, shape and so on. It emphasizes also synonyms, antonyms and shades of meaning.

The whole is set out simply and clearly and will be of interest to all concerned with medical terminology. Errata slips are always annoying and the book has a long one—although "Leon, leontis, L" on page 54 goes unnoticed.

The second, written for American medical students, aims at providing a guide to word-building and a background to the terms they will have to use.

It has a short introduction on word formation, Latin forms, transliteration of Greek to Latin and English, Greek prefixes and verb stems. Then follow 150 pages of word elements used in medical phraseology. All the information is attractively set out and the illustrations are a change from the rather dreary little sketches so often found in books of this sort.

John Rathborn

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